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Space & Missile Systems Center
Los Angeles Air Force Base, Calif.

Laser Test Facility

Environmental Assessment

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14. ABSTRACT
The purpose of the Laser Test Facility (LTF) is to test laser hardware in an integrated manner. The LTF would be a unique facility designed to meet the testing and technology requirements of laser systems similar to the Readiness Demonstrator developed under the Zenith Star contract as well as other potential laser systems. The LTF is needed because no existing test facility has the required combination of capabilities, such as the management of a high energy, large cross-section beam, that would allow this scale of demonstration testing. The general facility would consist of a Performance Test Chamber Complex (approximately 6 hectares (15 acres) with a 4-hectare (10 acre) construction lay down area) surrounded by a 1.2-kilometer (0.75 mile) radius safety zone and an Integration and Test Complex (approximately 10 hectares (25 acres)) located outside the safety zone.

The four alternative locations under consideration for development of the LTF are Cape Canaveral Air Station, Florida; Kennedy Space Center, Florida; Redstone Arsenal, Alabama; and Stennis Space Center, Mississippi.

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Executive Summary

EXECUTIVE SUMMARY

Introduction

The Space Based Laser (SBL) program has been a long-term research program of the U.S. Government. Technology development work to date has resulted in sub-scale and at-scale versions, scalable and/or traceable to the Operational System, of all the essential components of the SBL. Following ongoing technology development work, high power laser testing and testing of the complete integrated system are key aspects of the SBL development process. This current phase of the SBL vehicle development includes the Integrated Flight Experiment (IFX).

The design of the IFX test vehicle has not yet been determined. Since final designs have not been completed, this environmental assessment (EA) will analyze the potential environmental consequences of the construction and operation of a new Laser Test Facility (LTF) that would accommodate a laser with the characteristics of the Readiness Demonstrator (RD) vehicle concept developed on the Zenith Star contract. It is anticipated that the IFX laser would be similar to the RD and would be less stressing to the environment. At present, there are no facilities that could accommodate fully integrated testing of the RD vehicle.

Proposed Activities

The LTF would be a unique facility designed to meet the testing and technology development requirements of the RD vehicle. The general facility would consist of a Performance Test Chamber (PTC) Complex of approximately 6 hectares (15 acres) surrounded by a 1.2-kilometer (0.75-mile) radius Laser Safety Zone. An Integration and Test (I&T) Complex with a remote control room, administration/engineering facility, shops/labs area, and plant protection facilities that occupy approximately 10 hectares (25 acres) would be located outside the Laser Safety Zone. Up to 4 hectares (10 acres) of additional area may be required for construction equipment work areas.

The LTF concept includes Phase 1 with initial facilities for receipt, checkout, and performance and acceptance testing of the RD Laser Payload Element (LPE). During Phase 2, additional facilities would be built at the I&T Complex to allow for receipt, testing, checkout, and integration of the elements into the full RD vehicle. The PTC would then be expanded, and testing of the integrated vehicle would be performed.

A construction period of approximately 30 months is anticipated. Construction activities could begin in the second quarter of fiscal year (FY) 01 and continue through the third quarter of FY 03. Construction personnel requirements would average approximately 600 for the first 6 months and 400 for the remaining 24 months.

Initial construction activities after final design would primarily entail grading the ground. Construction equipment laydown, personal vehicle parking, temporary mobile offices

(trailers), maintenance facilities, and other construction needs would occur in previously disturbed areas or in accordance with construction plans to minimize disturbance to the environment. Earthwork for construction would be performed in accordance with a construction Storm Water Pollution Prevention Plan and Spill Prevention, Control, and Countermeasures Plan that would be developed for this project.

A temporary truck washdown area would be provided within the boundaries of the construction laydown areas. The washdown area would include an impoundment to contain wastewater. The impoundment would use an oil/water separator to treat the water before release to the sanitary sewer system.

Approximately 20 hectares (50 acres) of land would be disturbed during construction activities. This area includes the building footprints plus construction areas for equipment laydown, etc. Depending on final design and grading plans, earth movement would involve approximately 26,760 cubic meters (35,000 cubic yards) of cut and fill material. Unused cut material would be removed from the project area to an approved spoil site. It is expected that construction material would be transported by truck to the site.

An operations period of approximately 24 months is anticipated. LTF site operations could begin in the fourth quarter of FY 03 and continue through the fourth quarter of FY 05. Approximately 165 persons would be needed to operate the facility. Operations would include the following steps:

- Receive individual elements
- Test and assemble elements
- Conduct acoustic, environmental, and performance tests of the assembled LPE
- Conduct acoustic, environmental, and performance tests of the assembled RD integrated vehicle

Individual elements would be shipped via commercial or DOD carrier from the manufacturing location and would arrive at the I&T Complex where they would undergo testing. The elements would then be assembled to form the LPE. The LPE would undergo acoustic and thermal testing at the I&T Complex before being moved to the PTC Complex. The final integration would take place at the PTC Complex.

The fully integrated LPE would then undergo performance testing. The low-power laser would be started for PTC initial alignments at atmospheric conditions. This system would have its own vacuum and scrubber. The next step in the performance test would be to load the LPE with chemical reactants. Diesel fuel would be used to heat water to create steam. Operation of the steam boilers would be incorporated into the appropriate Title V or other Air Permit. Steam generators would then be started at the beginning of the test sequence and would be exhausted through the PRS, a multi-stage steam ejector pumping system that would create a vacuum to remove exhaust gas from the PTC. The PRS would operate for approximately 100 seconds before the high power laser operation begins. Operation of the high power laser would then begin and continue for approximately 60

seconds. The exhaust products of the laser generation would be exhausted into the PRS. The lased beam would be directed into diagnostic instruments and into a beam dump.

The steam generators and PRS would continue running during the laser operation and for approximately 40 seconds after laser shut-down. Following laser shut-down, the system would be purged of any remaining reactants by blowing an inert gas such as nitrogen or helium through the lines to push the residual substance out of the system or dilute it to acceptable levels.

After LPE testing, the PTC would be expanded to allow the Optical Payload Element and Spacecraft Element to be installed on the LPE to create the RD vehicle. These activities and the testing would follow similar steps as described above for the LPE. Approximately 12 tests would be conducted for the RD vehicle.

A 1.2-kilometer (0.75-mile) radius Laser Safety Zone would be established around the PTC for areas that could be potentially affected by accidents with the reactants used in the laser system during a test. Loading of reactants at the onset of a test would not be allowed if an undue hazard exists to persons and property because of potential dispersion of hazardous materials. Prior to operations involving reactants, a dispersion computer model would be used to determine the toxic hazard corridor. If the toxic hazard corridor encompasses any unprotected areas, the operation would be put on hold until more favorable meteorological conditions exist. Explosive Safety Quantity-Distance (ESQD) criteria would be used to establish safe distances for facilities with an explosive potential to non-related facilities.

Methodology

This EA is limited to the construction and operation of the LTF to test the RD vehicle. Further National Environmental Policy Act documentation would be prepared for any additional construction and testing.

This EA describes and addresses the potential environmental impacts of construction and operation of the LTF at four alternative site locations, Cape Canaveral Air Station (Cape Canaveral AS) and Kennedy Space Center (KSC) located in Florida, and Redstone Arsenal (RSA), Alabama, and Stennis Space Center (SSC), Mississippi. The EA also considers the potential environmental impacts of the No-action Alternative.

Consistent with Ballistic Missile Defense Organization Directive No. 6050 and the Council on Environmental Quality regulations, the scope of analysis presented in this EA is defined by the potential range of environmental impacts that would result from implementation of the Proposed Action and alternatives. Resources that have a potential for being impacted were considered in order to provide the decisionmaker with sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a Finding of No Significant Impact. The resources analyzed are: air quality, airspace, biological resources, cultural resources, geology and soils, hazardous materials and

hazardous waste management, health and safety, land use and aesthetics, noise, socioeconomics, transportation, utilities, water resources, and environmental justice.

Results

This section summarizes the conclusions of the analyses made for each of the 14 areas of environmental consideration based on the application of the described methodology. Within each resource summary, only those activities for which a potential environmental concern was determined are described.

Air Quality. No exceedance of air quality standards or health-based standards of non-criteria pollutants would be anticipated during construction. All installations are in attainment areas. Operational emissions would be incorporated into the installation's Title V Air Permit or if that is not practicable, the LTF would obtain an independent operating permit. If the permit needs to be re-negotiated, or if a new permit were required, this could require up to a year or more to finalize. Laser testing would be a periodic event rather than a continuous process. Emissions from testing would dissipate to non-toxic levels within the Laser Safety Zone. Therefore, no long-term impacts to ambient air quality would be anticipated due to proposed activities.

Airspace. Notice of Proposed Construction to the Federal Aviation Administration would be required. No impacts are anticipated.

Biological Resources. Construction and test activities would be conducted in a manner that minimizes disruption of wildlife and habitat disturbance in the affected areas to the extent practicable. Although removal of vegetation could displace wildlife, it would not result in a substantial reduction in habitat available for wildlife in the affected areas. Any vegetation impacts associated with clearing areas potentially used by the Florida scrub jay would be in compliance with plans currently in place at Cape Canaveral AS and KSC. There is a potential to impact scrub habitat management activities on Merritt Island National Wildlife Refuge (MINWR) and Cape Canaveral AS. The potential for injury of wildlife due to increased vehicle traffic is another potential impact.

Construction and test noise would result in localized and short-term startle effects to wildlife in the immediate area. Approximately 10 hectares (25 acres) of wetlands at KSC and 20 hectares (50 acres) at SSC would be affected. No wetlands at Cape Canaveral AS or RSA would be affected by proposed activities. Testing emissions would be at low levels (maximum concentration of 0.006271 grams of hydrogen fluoride per cubic meter) within the Laser Safety Zone. No adverse effects to terrestrial wildlife species, such as birds flying through the area following a test, are expected as a result of this level of hydrogen fluoride emission. Due to the natural buffering capacity of nearby surface waters, the deposition of small amounts of hydrogen fluoride are anticipated to result in only minor and temporary decreases in water pH.

Cultural Resources. Construction ground disturbance would generally occur in areas with low potential for affecting cultural resources. Continued consultation with the State

Historic Preservation Officer and the development and implementation of appropriate mitigation measures would offset potential impacts.

Geology and Soils. Standard methods employed during construction would minimize the short-term impacts of dust generation and erosion.

Hazardous Materials and Hazardous Wastes. The proposed LTF activities would slightly increase the overall use of hazardous materials and consequently increase the generation of hazardous wastes at the proposed facilities. At the LTF facilities, these hazardous materials and hazardous wastes would be handled, stored, and disposed of in accordance with established procedures pertaining to hazardous materials and hazardous wastes and all applicable Federal, state, and local regulations and procedures.

Health and Safety. There would be no increased hazards to the public. Worker risk would be within applicable guidelines, however operations at Cape Canaveral AS LC-13, LC-14, LC-16, and LC-19 would have to be suspended and personnel evacuated when the Laser Safety Zone is active. The ESQD associated with the LTF site would restrict the use of portions of LC-14 and LC-16. Likewise, personnel at the LTF would be evacuated during launch activities at other complexes, such as CX 36. At SSC, tenant organizations within the 9600 area and Building 9138 would be required to evacuate the area when the Laser Safety Zone is active. Proposed activities would not impact any off-base land uses. Potential for a mishap during handling is unlikely. In the event of an unlikely accidental leak, the Risk Management Plan required by the Clean Air Act, section 112 (r), would address the immediate response to be taken in order to minimize the impact on the populace and the environment. The LTF would be a restricted access area, and would incorporate a variety of standard operating procedures, security devices, and precautionary operating restraints. The incorporation of these steps would protect operations personnel and non-project personnel from adverse health or safety impacts.

Land Use. LTF construction would be compatible with regional and local planning/zoning and surrounding off base land uses. Operations at Cape Canaveral AS LC-13, LC-14, LC-16, and LC-19 would have to be suspended and personnel evacuated when the Laser Safety Zone is active. The ESQD associated with the LTF site would restrict the use of portions of LC-14 and LC-16. Likewise, personnel at the LTF would be evacuated during launch activities at other complexes, such as CX 36. At KSC, approximately 16 hectares (40 acres) of Wildlife Refuge would be transferred to KSC, resulting in impacts on management of the MINWR. At RSA, approximately five storage igloos would be taken out of service. Other igloos would be inaccessible when the Laser Safety Zone is active. At SSC, tenant organizations within the 9600 area and Building 9138 would be required to evacuate the area when the Laser Safety Zone is active. Proposed activities would not impact any off-base land uses.

Noise. Construction related noise levels would be similar to industrial complex construction and would dissipate to background levels before reaching any sensitive receptors. Testing noise levels would dissipate to less than 85 decibels at the 1.2-

kilometer (0.75-mile) Laser Safety Zone boundary, and would dissipate to background levels before reaching any sensitive receptors.

Socioeconomics. Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities' retail sales and tax base. No impact on public services is expected.

Transportation. Some increase in traffic would occur during construction and operation. Total average daily traffic would remain within the design limits for most affected roadways. Level of service change would be minimal. Upgrading of Schwartz Road West and Roberts Road at KSC and widening of Blueberry Road at RSA would be required to support project activities and would result in impacts to current users during construction. If rail transportation were required at RSA or SSC, refurbishment of lines could be necessary.

Utilities. Current utility systems have adequate capacity to support construction and operation, but would require connections to main lines and feeders via established right-of-ways. During construction, erection of a temporary concrete batch plant would be necessary to facilitate collection, treatment, and disposal of wastewater.

Water Resources. Compliance with the LTF Spill Prevention Control and Countermeasures Plan would minimize the potential for accidental spills of hazardous chemicals to affect surface and groundwater. There is a minor potential for short-term sediment increase in surface water during construction. All activities would be carried out in accordance with appropriate regulations. Required permits and storm water plans would be implemented to minimize impacts to water resources. The quality of surface water and groundwater would not be measurably changed.

Environmental Justice. The proposed activities would be conducted in a manner that would not substantially affect human health or the environment. The activities would also be conducted within the existing boundaries of a government installation, and would not produce emissions or other environmental effects that would have a disproportionate or inordinate impact on low-income or minority groups.

Acronyms and Abbreviations

ACRONYMS AND ABBREVIATIONS

45 SW	45^{th} Space Wing
AAQS	Ambient Air Quality Standards
ACM	Asbestos-containing Material
ADEM	Alabama Department of Environmental Management
ADT	Average Daily Traffic
AFB	Air Force Base
AF-EMIS	Air Force Environmental Management Information System
AGL	Above Ground Level
AMCOM	Aviation and Missile Command
AR	Army Regulation
AS	Air Station
BMDO	Ballistic Missile Defense Organization
C	Celsius
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CWA	Clean Water Act
dB	Decibel
dBA	A-weighted Decibels
DEMP	Directorate of Environmental Management and Planning
DOD	Department of Defense
DOT	Department of Transportation
DRMO	Defense Reutilization and Marketing Office
EA	Environmental Assessment
EMI/EMC	Electromagnetic Interference/Electromagnetic Compatibility
EO	Executive Summary
EPCRA	Emergency Planning and Community Right-To-Know Act
ERP	Environmental Resource Permit

ESC	Environmental Support Contractor
ESQD	Explosive Safety Quantity-Distance
F	Fahrenheit
FAA	Federal Aviation Administration
FAC	Florida Administrative Code
FCMA	Florida Coastal Management Act
FDCA	Florida Department of Community Affairs
FDEP	Florida Department of Environmental Protection
FY	Fiscal Year
GSE	Ground Support Equipment
I&T	Integration and Test
ICUZ	Installation Compatible Use Zone
IFX	Integrated Flight Experiment
IRP	Installation Restoration Program
JPC	Joint Propellants Contractor
KSC	Kennedy Space Center
kV	Kilovolt
kVA	Kilovolt-ampere
kWh	Kilowatt-hour
LBS	Launch Base Support
LC	Launch Complex
LOS	Level of Service
LPE	Laser Payload Element
LTF	Laser Test Facility
MINWR	Merritt Island National Wildlife Refuge
MMBTU	Million British Thermal Units
MPC	Mississippi Power Company
MSAAP	Mississippi Army Ammunition Plant
MSFC	Marshall Space Flight Center

msl	Mean Sea Level
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOTAM	Notice to Airmen
NPDES	National Pollutant Discharge Elimination System
ODC	Ozone-depleting Chemical
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyls
pH	Hydrogen ion concentration
PM-10	Particulate Matter with a Mean Aerodynamic Diameter of a Nominal 10 Micrometers
ppm	Parts per Million
PRS	Pressure Recovery System
PSD	Prevention of Significant Deterioration
PTC	Performance Test Chamber
RCRA	Resource Conservation and Recovery Act
RD	Readiness Demonstrator
RI/FS	Remedial Investigation/Feasibility Study
ROI	Region of Influence
RSA	Redstone Arsenal
SBL	Space Based Laser
SH	State Highway
SHPO	State Historic Preservation Officer
SPCC	Spill Prevention, Control, and Countermeasures
SR	State Road
SSC	Stennis Space Center
SWPPP	Storm Water Pollution Prevention Plan

TVA	Tennessee Valley Authority
USACE	U.S. Army Corps of Engineers
U.S.C.	U.S. Code
U.S. EPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UST	Underground Storage Tank
VAB	Vehicle Assembly Building
VOC	Volatile Organic Compound
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

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1.0 Purpose of and Need for the Proposed Action

1.0 PURPOSE OF AND NEED FOR THE PROPOSED ACTION

The National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S. Code [U.S.C.] 4341, et seq.], the Council on Environmental Quality regulations implementing the NEPA (40 Code of Federal Regulations [CFR] 1500-1508), Department of Defense (DOD) Instruction 4715.9, *Environmental Planning and Analysis* (U.S. Department of Defense, 1996), and Ballistic Missile Defense Organization (BMDO) Directive No. 6050, *Environmental, Safety, and Health Program Management for BMDO Acquisition Activities* (Ballistic Missile Defense Organization, 1998a), which implements these laws and regulations, direct DOD officials to consider environmental consequences when authorizing or approving Federal actions. Accordingly, this environmental assessment (EA) is being prepared for the construction and operation of a Laser Test Facility (LTF) to provide technology demonstration that would support the Space Based Laser (SBL) program.

1.1 BACKGROUND

The SBL program has been a long-term research program of the U.S. Government. Technology development work to date has resulted in sub-scale and at-scale versions, scalable and/or traceable to the Operational System, of all the essential components of the SBL. Following ongoing technology development work, high power laser testing and testing of the complete integrated system are key aspects of the SBL development process. This current phase of the SBL vehicle development includes the Integrated Flight Experiment (IFX).

The design of the IFX test vehicle has not yet been determined. Since final designs have not been completed, this EA will analyze the potential environmental consequences of the construction and operation of a new LTF that would accommodate a laser with the characteristics of the Readiness Demonstrator (RD) vehicle concept developed on the Zenith Star contract. It is anticipated that the IFX laser would be similar to the RD and would be less stressing to the environment. As a national asset, the LTF could be used for testing other lasers or similar systems. At present, there are no facilities that could accommodate fully integrated testing of the RD vehicle.

1.2 PURPOSE OF AND NEED FOR PROPOSED ACTION

The purpose of the LTF is to provide a facility that would allow technology demonstration of RD vehicle type laser hardware in an integrated manner.

The LTF is needed because no existing DOD or National Aeronautics and Space Administration (NASA) test facility has the required combination of capabilities that would

allow this scale of demonstration testing. These requirements include: a very large-scale vacuum chamber capable of rapid purging of hazardous emissions; the management of a high energy, large cross-section laser beam; and the precise control of temperature, humidity, vibration, and cleanliness in a chamber accessible to large space vehicles. These technical requirements need to be satisfied at a location that can provide air and barge transportation access for large space vehicles.

1.3 DECISIONS TO BE MADE

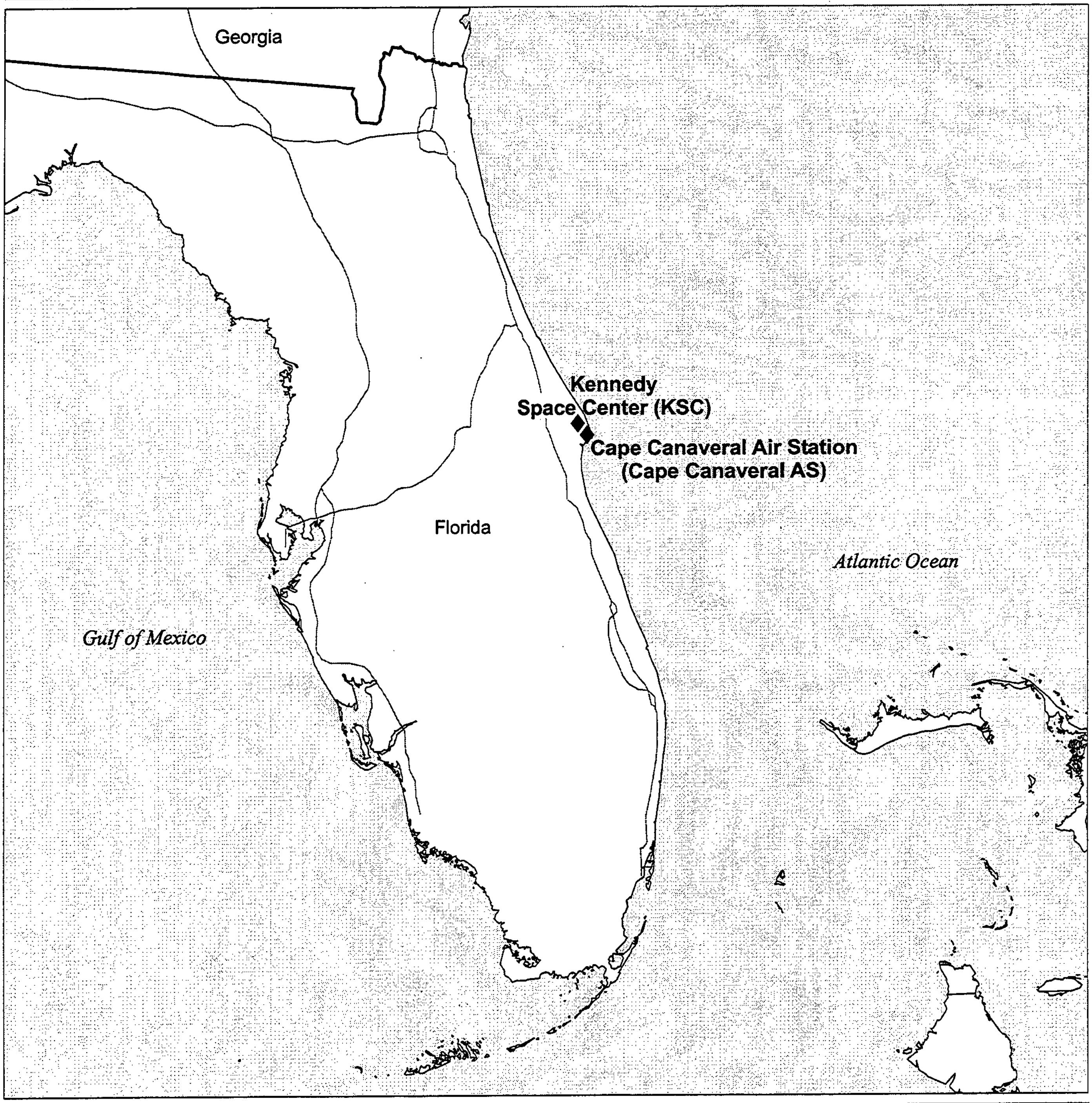
The U.S. Army Space and Missile Defense Command is preparing this EA to provide the decisionmaker and the public with information required to understand the future potential environmental consequences resulting from the construction and operation of the LTF. The information contained in this EA will support the decision to prepare a Finding of No Significant Impact or to file a Notice of Intent to prepare an environmental impact statement. The decisions to be made by the Director of the BMDO, supported by information contained in this EA, are (1) whether to construct and operate the LTF, (2) selection of a site on which to construct and operate the facility, and (3) acceptance of environmental mitigations, to be implemented as part of the selected alternative, which would avoid, minimize, or rectify potential adverse effects to the environment. Site selection will be made in conjunction with installation approval.

This EA is limited to the construction and operation of the LTF to test the RD vehicle. Further NEPA documentation would be prepared for any additional construction and testing.

1.4 SCOPE OF THE ENVIRONMENTAL REVIEW

This EA describes and addresses the potential environmental impacts of construction and operation of the LTF at four alternative site locations. Figure 1-1 shows Cape Canaveral Air Station (Cape Canaveral AS) and Kennedy Space Center (KSC) located in Florida. Figure 1-2 shows Redstone Arsenal (RSA), Alabama, and Stennis Space Center (SSC), Mississippi. The EA also considers the potential environmental impacts of the No-action Alternative.

Consistent with BMDO Directive No. 6050 and the Council on Environmental Quality regulations, the scope of analysis presented in this EA is defined by the potential range of environmental impacts that would result from implementation of the Proposed Action and alternatives. Resources that have a potential for being impacted were considered in order to provide decisionmakers with sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a Finding of No Significant Impact (40 CFR 1508.9). The resources analyzed are: air quality, airspace, biological resources, cultural resources, geology and soils, hazardous materials and hazardous waste management, health and safety, land use and aesthetics, noise, socioeconomics, transportation, utilities, water resources, and environmental justice.



EXPLANATION

Major Roadways

LTF Alternative Locations

Scale 1:4,000,000

0 50.5 101 Kilometers

0 31.5 63 Miles

NORTH

Florida

Figure 1-1

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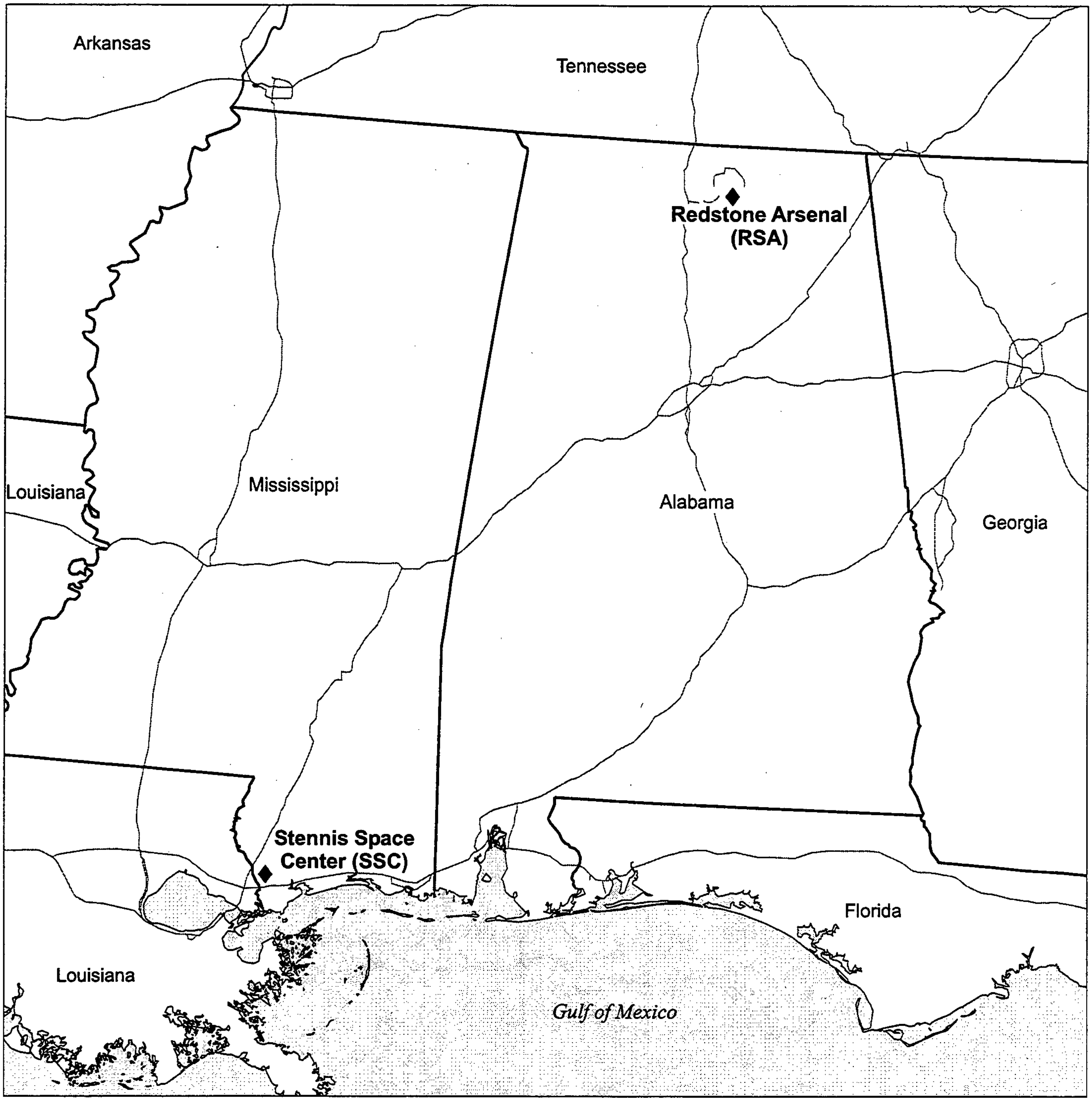

EXPLANATION

Major Roadways

LTF Alternative Locations

Scale 1:4,000,000

0 50.5 101 Kilometers

0 31.5 63 Miles

NORTH

Alabama and Mississippi

Figure 1-2

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1.5 ORGANIZATION OF THIS ENVIRONMENTAL ASSESSMENT

This EA is organized into the following chapters and appendices: Chapter 2.0 provides a description of the LTF program, alternative locations for the proposed LTF program, the No-action Alternative, and a brief discussion of those alternatives evaluated early in the process but later eliminated from consideration. Chapter 2.0 also provides a comparative summary of the alternatives with respect to effects on the local community and the natural environment. Chapter 3.0 presents the affected environment at Cape Canaveral AS, KSC, RSA, and SSC, providing a basis for analyzing the impacts of the alternatives. The results of the environmental analysis are presented in chapter 4.0 and form the basis for the summary table at the end of chapter 2.0. Chapter 5.0 contains references, chapter 6.0 provides a list of the document's preparers, and chapter 7.0 lists individuals and organizations consulted during the preparation of the EA.

In addition to the main text, the following appendices are included in this document:

- Appendix A—distribution list
- Appendix B—correspondence and certification regarding conditions relevant to the LTF program
- Appendix C—a summary of laws and regulations considered for each resource area
- Appendix D—Air Quality
- Appendix E—Cultural Resources

1.6 RELATED ENVIRONMENTAL DOCUMENTATION

Related NEPA documentation previously prepared includes the following:

National Aeronautics and Space Administration, 1990. *Supplemental Final Environmental Impact Statement, Space Shuttle Advanced Solid Rocket Motor Program*, August.

National Aeronautics and Space Administration, 1997. *Final Environmental Impact Statement of Engine Technology Support for NASA's Advanced Space Transportation Program,* July.

National Aeronautics and Space Administration, 1997. *Final Environmental Impact Statement, X-33 Advanced Technology Demonstrator Vehicle Program*, September.

U.S. Air Force, 1998. *Final Environmental Impact Statement, Evolved Expendable Launch Vehicle Program,* April.

U.S. Army Armament, Munitions and Chemical Command, 1990. *Environmental Assessment for the Layaway of the Mississippi Army Ammunition Plant, Picayune, MS*, July.

U.S. Army Missile Command, 1994. *Final Environmental Assessment for Redstone Arsenal Master Plan Implementation*, December.

2.0 Description of Proposed Action and Alternatives

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

This section of the EA provides a description of the LTF; the alternative locations for the Proposed Action; the ground support equipment (GSE) manufacturing locations; the No-action Alternative; alternatives considered but not carried forward; and a comparison of environmental impacts.

2.1 DESCRIPTION OF THE LASER TEST FACILITY

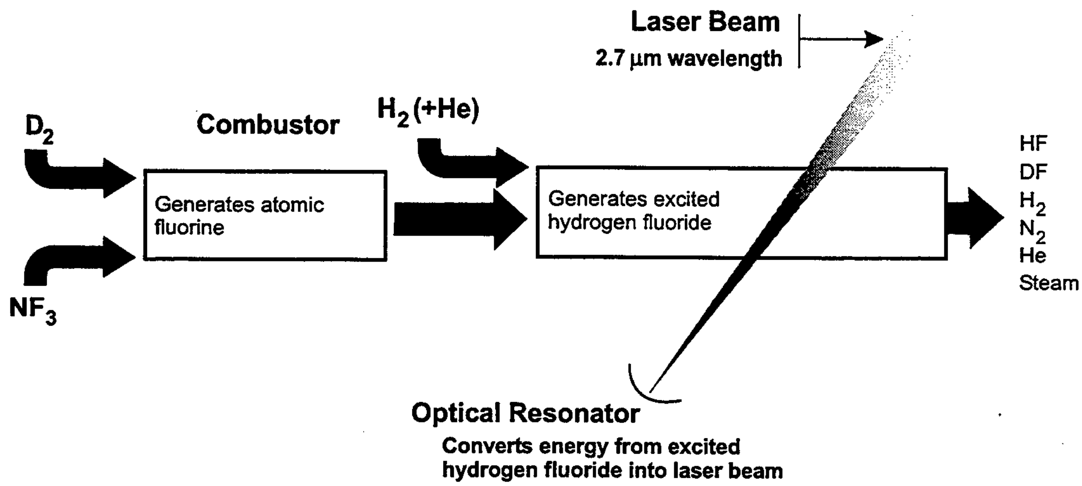
This section provides a general description of the RD vehicle concept laser, the facilities and equipment required for testing, the general construction activities that would be required for the LTF program, and the personnel requirements and operational activities conducted at the facility.

2.1.1 READINESS DEMONSTRATOR CONCEPT VEHICLE

The RD vehicle concept contains a high-energy chemical laser. It is powered by a nitrogen trifluoride–deuterium chemical reaction (figure 2-1). Free fluorine atoms are one of the products from this reaction. Just downstream from the reaction, molecular hydrogen and helium are injected into the "exhaust." The molecular hydrogen reacts with the atomic fluorine to yield excited hydrogen fluoride, while helium serves to stabilize and control the reaction. The laser resonator mirrors extract optical energy from the excited hydrogen fluoride as it makes a stimulated transition from the excited energy states to the lower energy states. The combustor can be run until the fuel supply is exhausted or the vacuum drawing the exhaust products runs out of steam. The laser output power can be varied over a wide range by altering the fuel flow rates and mixtures.

2.1.2 LTF FACILITIES

The LTF would be a unique facility designed to meet the testing and technology development requirements of the RD vehicle. The general facility would consist of a Performance Test Chamber (PTC) Complex of approximately 6 hectares (15 acres) surrounded by a 1.2-kilometer (0.75-mile) radius Laser Safety Zone (figure 2-2). An Integration and Test (I&T) Complex with a remote control room, administration/engineering facility, shops/labs area, and plant protection facilities that occupy approximately 10 hectares (25 acres) would be located outside the Laser Safety Zone (figure 2-2).



EXPLANATION

NF_3 = nitrogen trifluoride

D_2 = deuterium

H_2 = hydrogen

He = helium

HF = hydrogen fluoride

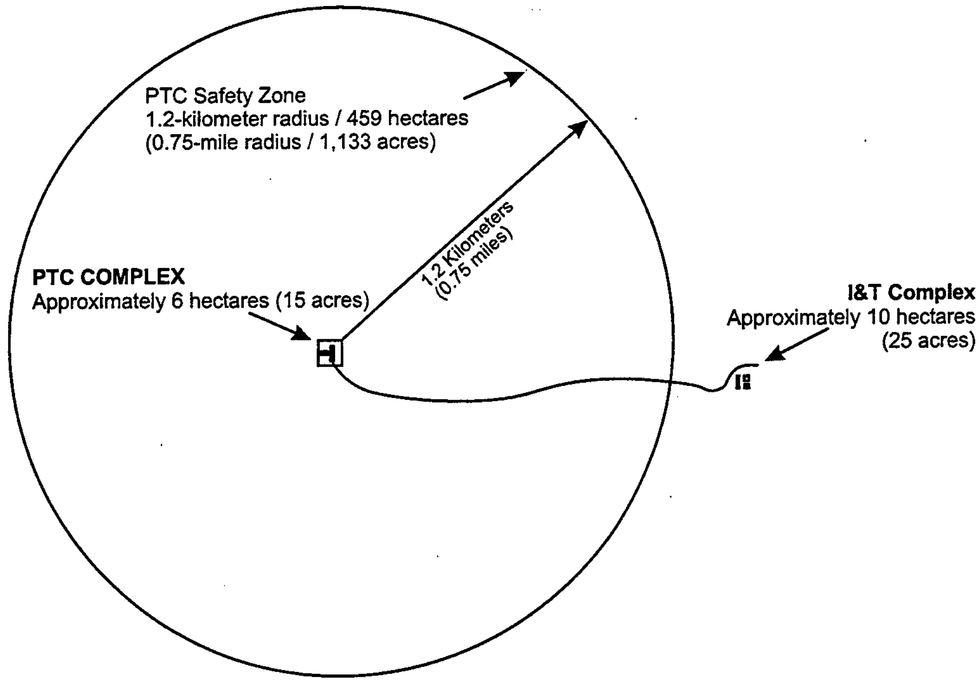
μm = microns (10^{-6} meters)

DF = deuterium fluoride

N_2 = nitrogen

Chemical Laser Fundamentals

Figure 2-1



Performance Test Chamber (PTC) Complex
- Performance Test Chamber
- Pressure Recovery System
- Reactants Storage and Transfer
- Performance Test Chamber Control Room (Local)
- Cleaning Area
- Cleanroom, Receiving, Integration, and Rotation Facility
- Controlled Storage

Integration and Test (I&T) Complex
- Performance Test Chamber Control Room (Remote)
- Acoustics, EMI/EMC, Thermal Vacuum Test Areas
- Administration/Engineering Facility
- Support Shops/Labs
- Plant Protection (Fire, Land, and Medical)

Notes: PTC - Performance Test Chamber
I&T - Integration and Test
EMI/EMC - Electromagnetic Interference/Electromagnetic Compatibility

LTF General Layout

Scale
0 345 690 Meters
0 1,132 2,263 Feet

Figure 2-2

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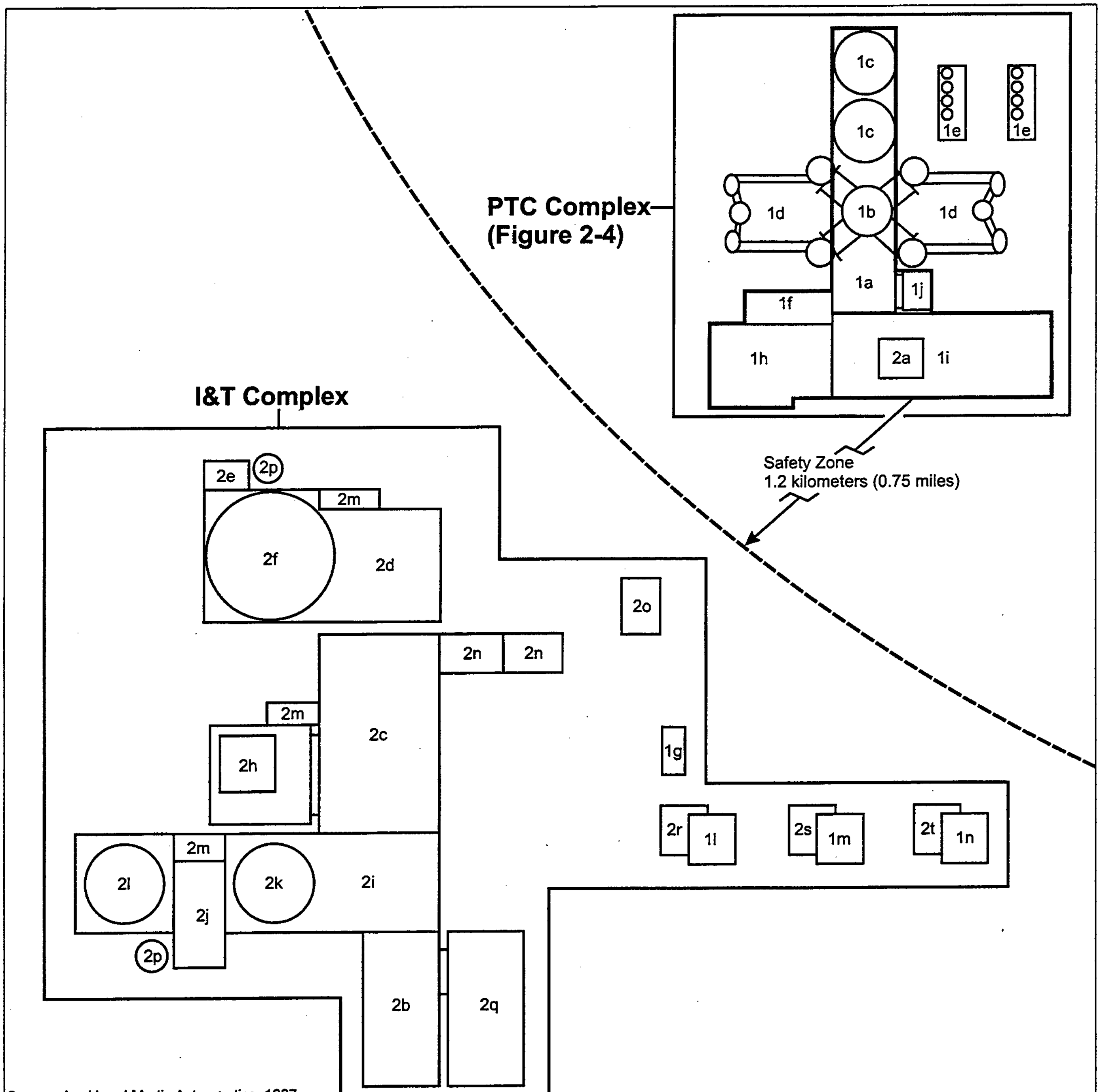
The LTF concept includes Phase 1 with initial facilities for receipt, checkout, and performance and acceptance testing of the RD Laser Payload Element (LPE). During Phase 2, additional facilities would be built at the I&T Complex to allow for receipt, testing, checkout, and integration of the elements into the full RD vehicle. The PTC would then be expanded and testing of the integrated vehicle would be performed. Figure 2-3 shows the notional layout of the facilities by phase, and figure 2-3a shows a functional layout of the chemical storage. Figures 2-4 and 2-4a depict the LTF elevation view, minus the Pressure Recovery System (PRS) and chemical storage areas. Table 2-1 lists the approximate facility dimensions. Figures 2-5 and 2-5a depict the PTC configured for the RD LPE performance test and RD integrated vehicle performance test, respectively.

The PTC (1b) would provide the vacuum chamber capable of holding the RD vehicle and associated test instrumentation (figure 2-5 and 2-5a). The PTC would support autonomous operation of the space vehicle, simulating the condition and manner in which the laser would operate on-orbit, and provide the capability to conduct laser performance testing. The PTC is a chamber designed to achieve and maintain conditions similar to a low/high orbital space environment for periods of up to 200 seconds. The chamber would be large enough to house the space vehicle and instrumentation, and would have access doors large enough to allow installation of a full sized RD vehicle, including transportation and structural support.

The PRS (1d) is a multistage steam ejector pumping system that would create a vacuum to remove exhaust gas from the PTC. A scrubber on the PRS would remove approximately 95 percent of the pollutants from the waste stream before discharging the residuals into the atmosphere (figure 2-6). Diesel fuel would be used as a fuel source for the boilers that are used to generate the steam. Approximately 13,250 liters (3,500 gallons) of fuel per test would be used for steam generation. A 56,780-liter (15,000-gallon) storage tank would be required for diesel storage.

The Storage and Handling areas (figures 2-3 and 2-3a) would consist of concrete pads with associated tankage, piping, valves, and related storage and transfer equipment to provide inert gases and reactants to the test chamber and diesel fuel and water to the PRS. The type of reactants and amounts that would be stored at the facility are listed in table 2-2. The storage areas would include short- and long-term parking areas for tube trucks that would store reactants and oxidizers. Required emergency response equipment would be included at appropriate locations.

The PTC Control Rooms (1f and 1g) would consist of a local control room and remote control room that would be required to operate the test equipment. The two rooms would have the same requirements with the local room adjacent to the test chamber, and the remote room outside the Laser Safety Zone.



Source: Lockheed Martin Astronautics, 1997

EXPLANATION

Phase 1

1a - Performance Chamber Building
1b - Performance Test Chamber (GSE)
1c - Chamber Spool and Bell Storage
1d - Pressure Recovery System (GSE)
1e - Reactants Storage and Transfer (GSE)
1f - Local Control Room
1g - Remote Control Room
1h - Cleaning Area
1i - Cleanroom, Receiving-Integration and Rotation Area
1j - Controlled Storage
1l - Administration/Engineering
1m - Program Support Shops/Labs
1n - Plant Protection-Fire, Medical
GSE - Ground Support Equipment

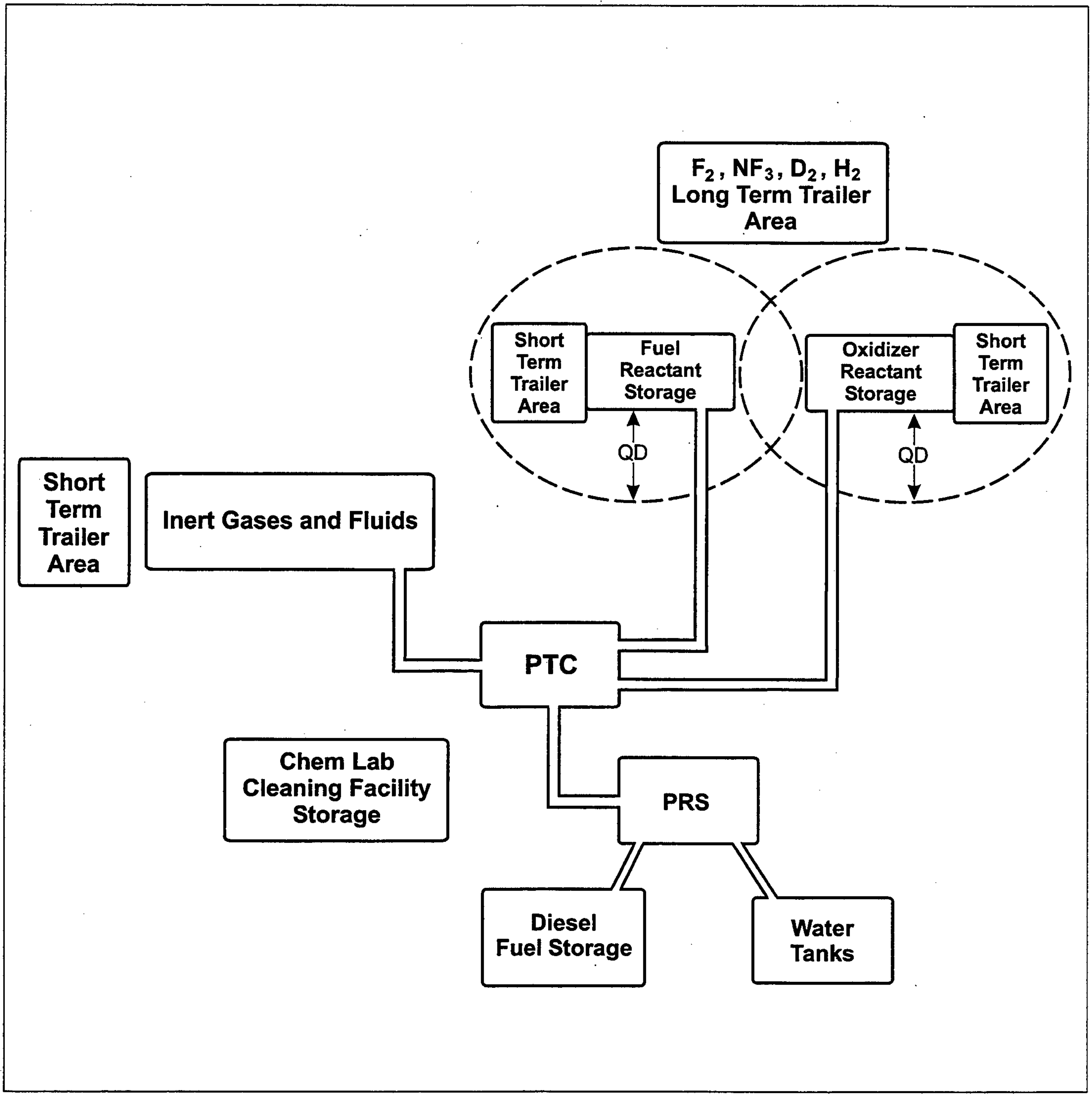
Not to Scale

Phase 2

2a - Vertical Integration Area
2b - Cleaning Area
2c - Cleanroom, Receiving-Integration and Rotation Area
2d - Acoustics Test Area
2e - Acoustics Equipment Area
2f - Acoustics Test Cell (GSE)
2h - EMI/EMC Test Cell (GSE)
2i - Thermal Vacuum Test Chamber Area
2j - Thermal Vacuum Chamber Equipment Area
2k - Thermal Vacuum Chamber (GSE)
2l - Thermal Vacuum Chamber Head Storage
2m - GSE Control Rooms
2n - Mission Control Room
2o - Presentation, Communications, and Visitors Center
2p - Cryogenics Storage
2q - Controlled Storage
2r - Administration/Engineering
2s - Program Support Shops/Labs
2t - Plant Protection-Fire, Medical

Notional LTF Facilities Layout

Figure 2-3

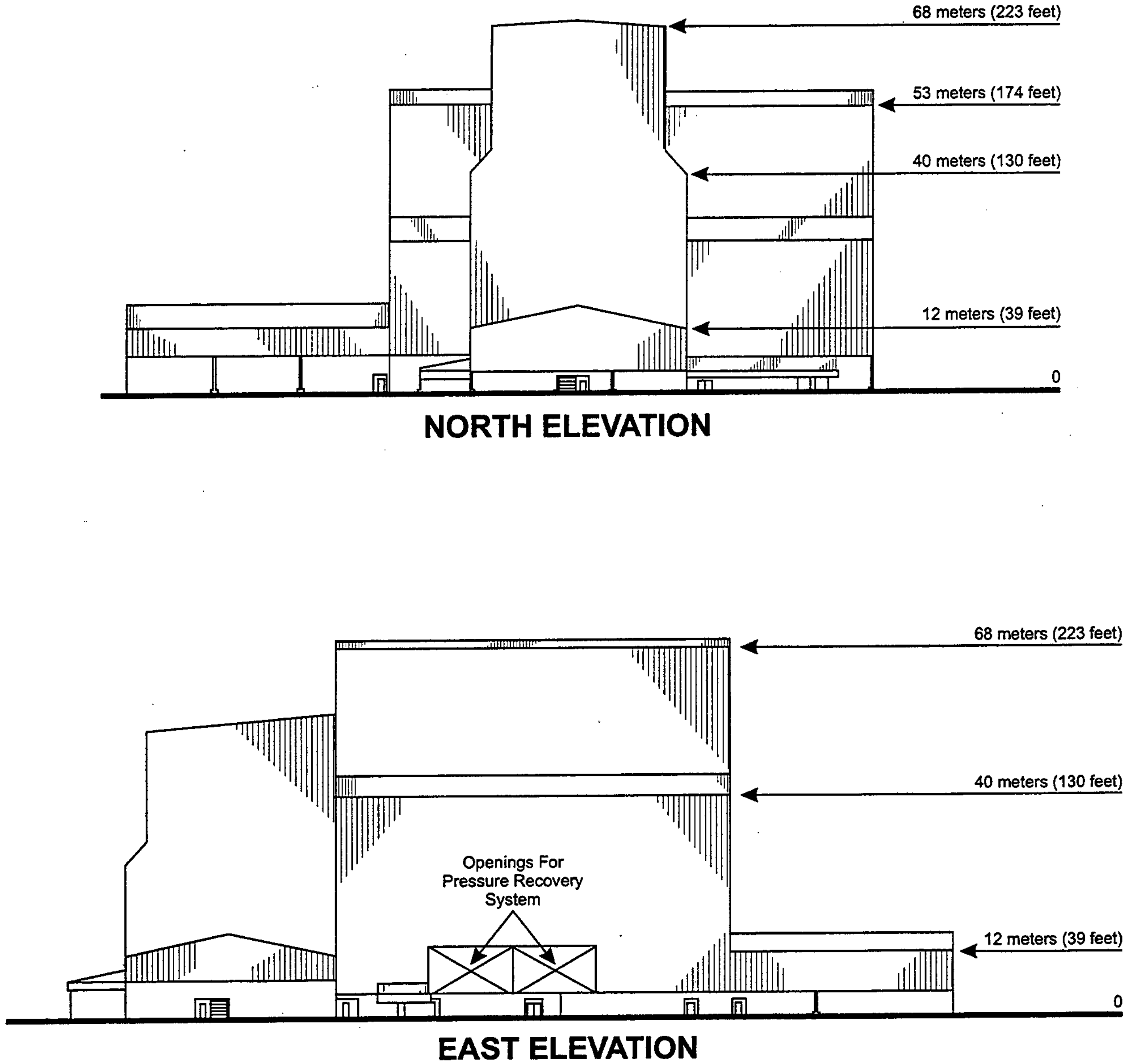


EXPLANATION

PTC = Performance Test Chamber
PRS = Pressure Recovery System
QD = Quantity Distance Safety Zone
D_2 = Deuterium
F_2 = Fluorine
H_2 = Hydrogen
NF_3 = Nitrogen Trifluoride

Chemical Storage Functional Layout

Figure 2-3a



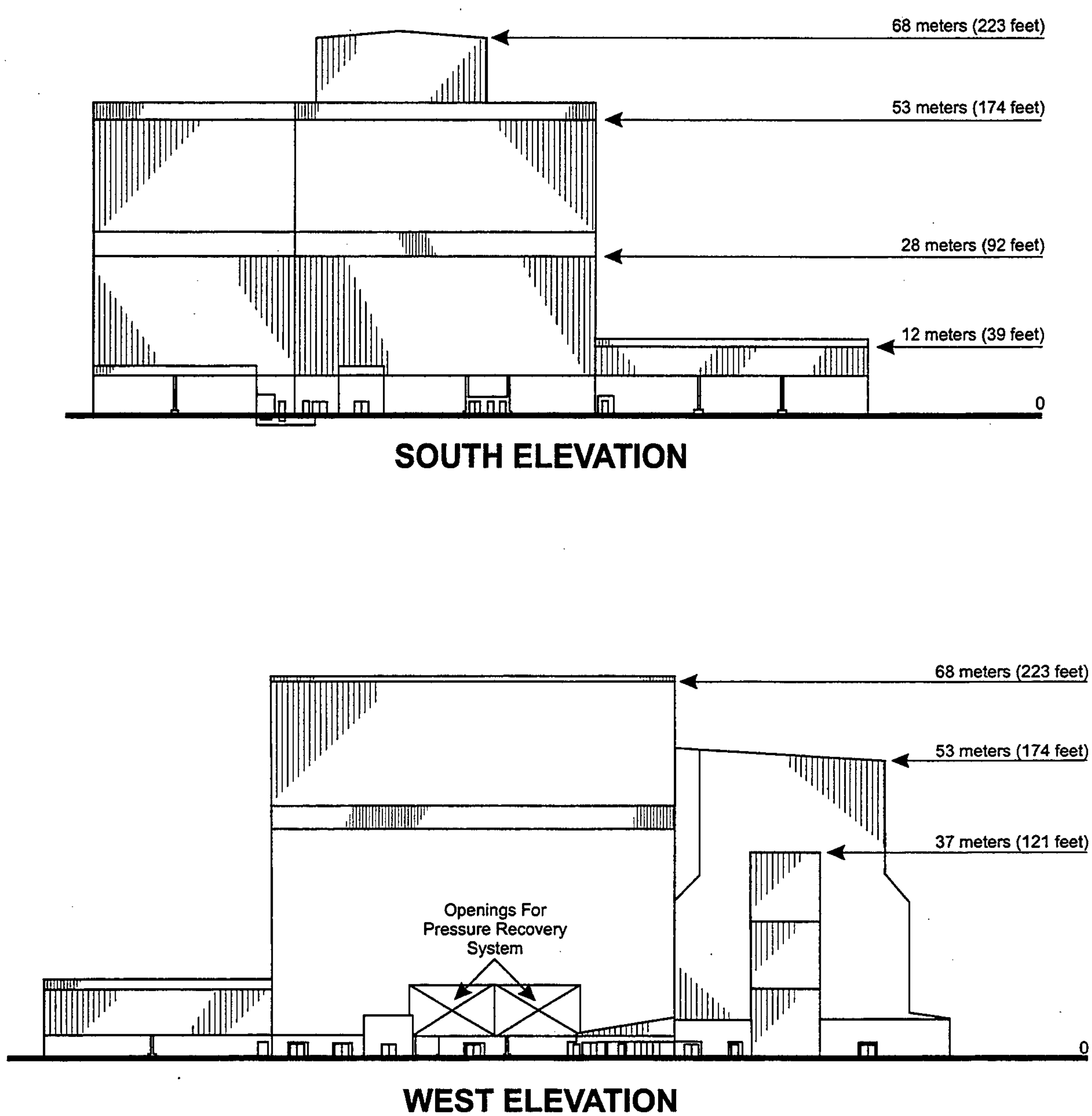
Source: U.S. Army Corps of Engineers, 1997.

LTF PTC Complex Building Elevations- North and East

Figure 2-4

Not to Scale

009ltf



Source: U.S. Army Corps of Engineers, 1997.

LTF PTC Complex Building Elevations-South and West

Figure 2-4a

Not to Scale

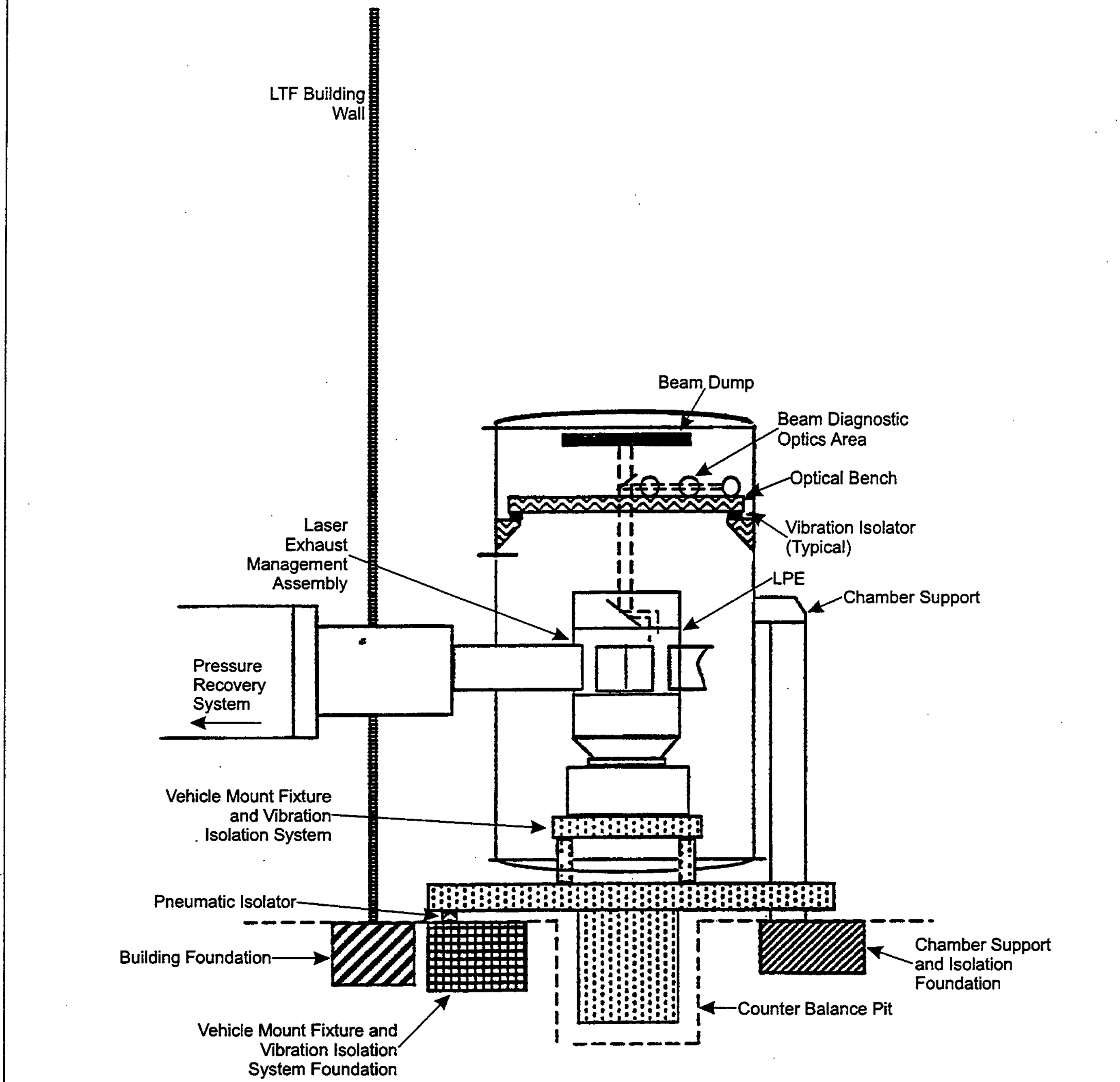
Table 2-1: LTF Facilities Approximate Dimensions

Facility*	Width in meters (feet)	Length in meters (feet)	Height in meters (feet)
Facilities Within Laser Safety Zone Area (PTC Complex)			
Laser Test Facility	140 (459)	163 (535)	68 (223)
Performance Test Chamber Building (1a)#	–	–	–
Performance Test Chamber (1b)#	–	–	–
Chamber Spool and Bell Storage (1c)#	–	–	–
Pressure Recovery System (1d)	90 (295)	135 (443)	NA
Performance Test Chamber Control Room (Local) (1f)#	–	–	–
Cleaning Area (1h)#	–	–	–
Cleanroom, Receiving, Integration, and Rotation Facility (1i)#	–	–	–
Controlled Storage (1j)#	–	–	–
Vertical Integration Area (2a)#	–	–	–
Reactant Storage and Handling Areas (1e)	24 (80)	31 (100)	NA
Facilities Outside Laser Safety Zone Area (I&T Complex)			
Performance Test Chamber Control Room (Remote) (1g)	9 (30)	15 (49)	4 (13)
Cleaning Area (2b)	14 (45)	40 (130)	40 (130)
Cleanroom, Receiving, Integration, and Rotation Facility (2c)	17 (55)	47 (155)	53 (174)
Acoustics Test Cell Facility (2d)	23 (75)	35 (115)	53 (174)
Acoustics Equipment Area (2e)	9 (30)	9 (30)	12 (39)
Acoustics Test Cell (2f) (within 2d)	–	–	–
EMI/EMC Test Area (2h)	11 (35)	17 (55)	53 (174)
Thermal Vacuum Test Chamber Area (2i)	16 (52)	72 (235)	68 (223)
Thermal/Vacuum Chamber Equipment Area (2j)	9 (30)	15 (50)	12 (39)
Thermal/Vacuum Chamber (2k) (within 2i)	–	–	–
Thermal/Vacuum Chamber Head Storage (2l) (within 2i)	–	–	–
Ground Support Equipment Control Rooms (2m)	11 (35)	11 (35)	4 (13)
Mission Control Room (2n)	11 (35)	11 (35)	4 (13)
Presentation, Communications, Visitors Center (2o)	ND	ND	ND
Cryogenics Storage (2p)	–	–	–
Controlled Storage (2q)	ND	ND	ND
Administration/Engineering Facility (1l and 2r)	ND	ND	ND
Support Shops/Labs (1m and 2s)	ND	ND	ND
Plant Protection (Fire and Medical Services) (1n and 2t)	ND	ND	ND

* See figure 2-3

Located within the Laser Test Facility building

NA = Not applicable (reactants are stored in individual containers)
ND = No data (design has not progressed to the point of determining dimensions)



Source: Lockheed Martin Astronautics, 1997.

EXPLANATION

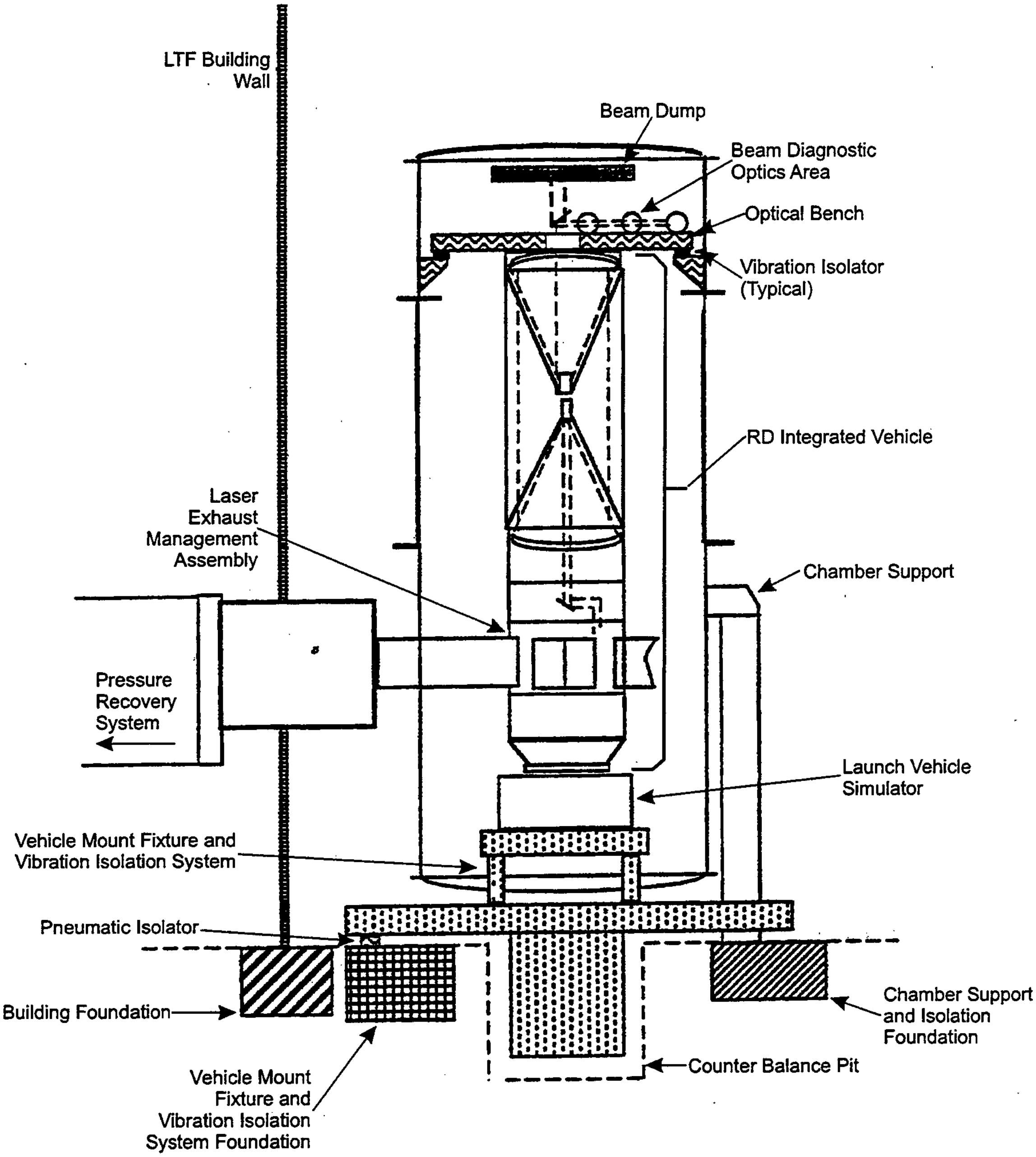
LPE - Laser Payload Element

Laser Performance Test Chamber, Phase 1 Laser Payload Element Performance Test

Figure 2-5

Not to Scale

001lptc



Source: Lockheed Martin Astronautics, 1997.

EXPLANATION

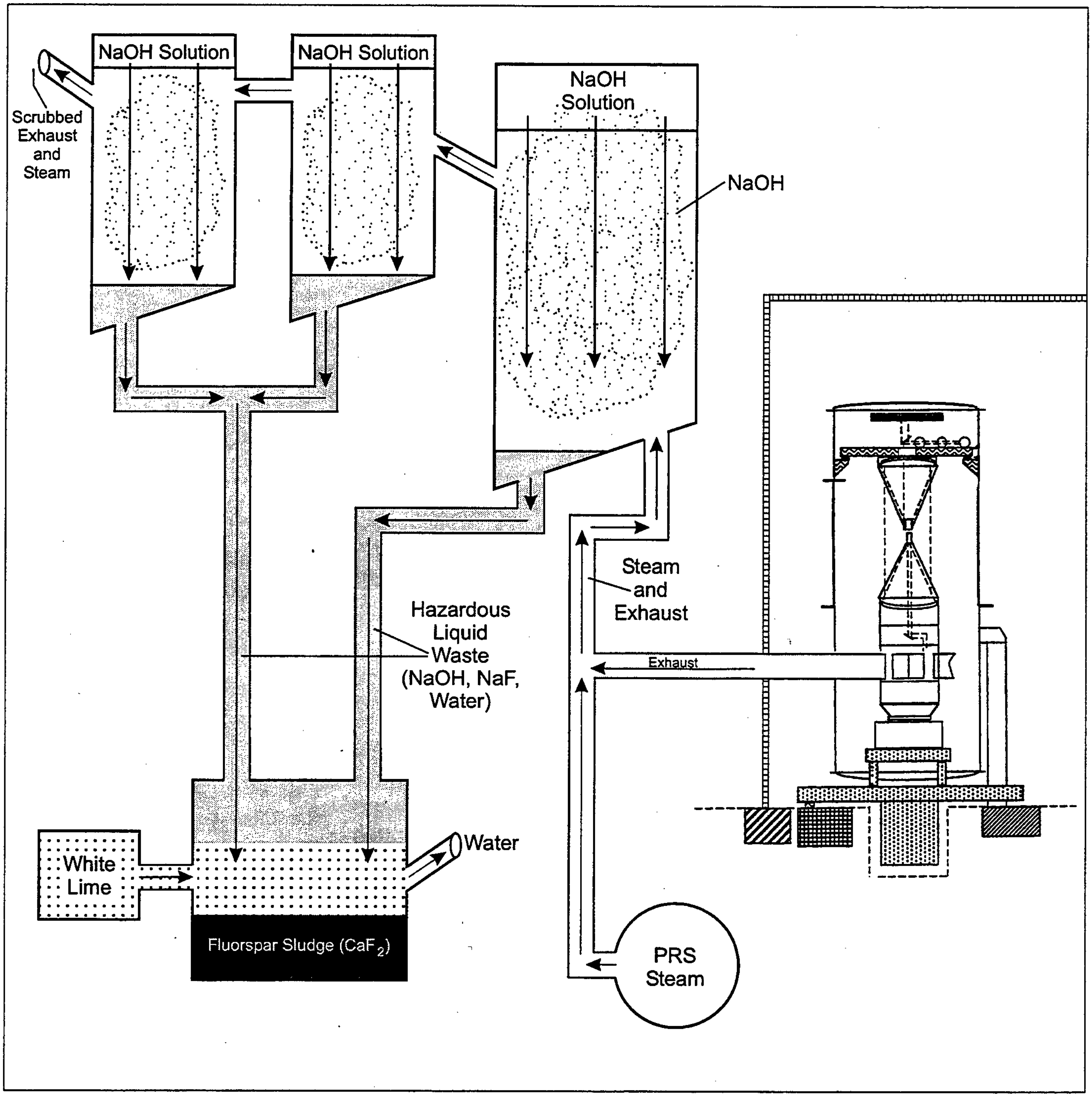
RD - Research and Development

Laser Performance Test Chamber, Phase 2 RD Integrated Vehicle Performance Test

Figure 2-5a

Not to Scale

002lptc



EXPLANATION

NaF = sodium fluoride

NaOH = sodium hydroxide

PRS = Pressure Recovery System

CaF_2 = Fluorspar Sludge

PRS Operational Schematic

Figure 2-6

Table 2–2: LTF Storage Requirements

Reactant/Compound	Delivery	Storage Mass
Nitrogen Trifluoride (NF_3)	Delivered in 7.1-cubic meter (250-cubic foot) trailers at 1,250 psia	3,184 kilograms (7,020 pounds)
Fluorine (F_2)	Delivered in K-bottles at 500 psia	10 kilograms (21 pounds)
Deuterium (D_2)	Delivered in 7.1-cubic meter (250-cubic foot) trailers at 2,500 psia	612 kilograms (1,350 pounds)
Helium (He)	Delivered in 28.3-cubic meter (1,000-cubic foot) trailers at 2,500 psia	2,286 kilograms (5,040 pounds)
Hydrogen (H_2)	Delivered in 7.1-cubic meter (250-cubic foot) trailers at 2,500 psia	336 kilograms (740 pounds)
Nitrogen (N_2)	Delivered in 22,712-liter (6,000-gallon) trailers	39,917 kilograms (88,000 pounds)
Diesel Fuel	Delivered by tanker	56,780 liters (15,000 gallons)
Sodium Hydroxide (NaOH)	Delivered in 208-liter (55-gallon) drums	833 liters (220 gallons)
Pressure Recovery System Water	Installation water supply	360,000 liters (95,000 gallons)
Sulfur Hexafluoride (SF_6)	Delivered as liquefied compressed gas in K-bottles	300 kilograms (660 pounds)
Oxygen (O_2)	Delivered as liquefied compressed gas in K-bottles	50 kilograms (110 pounds)
White Lime	Delivered in 23-kilogram (50-pound) bags	1,800 kilograms (3,970 pounds)
Hydrochloric Acid	Delivered in 208-liter (55-gallon) drum	833 liters (220 gallons)

psia = pounds per square inch absolute

The Cleaning Area (1h and 2b) would provide a facility for cleaning the shipping containers and equipment before entrance to the receiving and other cleanroom areas. This facility would include two hot-water truck washers and a truck drying area. Wastewater from the truck washing would run to grating-covered trench drains and then to an oil/water separator outside the facility before being directed into a sanitary sewer.

The Cleanroom/Receiving/Integration/Rotation Area (1i and 2c) would provide the capability for handling the elements of the full RD vehicle. This facility would provide receiving and integration areas and cleanroom capabilities for receiving and inspecting test hardware elements and the integrated RD vehicle. In addition, the facility would accommodate removal and insertion of the vehicle in the shipping container, storage of the shipping container, and rotation of the vehicle between horizontal and vertical attitudes.

The Controlled Storage Area (1j) would provide utility and storage space equal to 20 percent of the work area. The storage areas are for data and data storage media, fixtures, handling equipment, caging structures, test cables and equipment, and general support items.

The Acoustics Test Cell Facility (2d) would house the acoustic test cell reinforced concrete GSE, a vertical chamber 44 meters (145 feet) high with a 20-meter (66-foot) interior diameter. The space vehicle would be vertically mounted within the test cell. The Acoustics Test Cell would provide an acoustic shock wave that would simulate the environment created by the launch vehicle. The Acoustics Equipment Area would be a 9 x 9 x 9-meter (30 x 30 x 30-foot) area that would house the acoustic shock wave generators.

The Electromagnetic Interference/Electromagnetic Compatibility (EMI/EMC) Test Area (2h) facility would provide a shielded enclosure for EMI/EMC testing.

The Thermal/Vacuum Chamber Equipment Area (2j) would house all GSE, vacuum pumps, and thermal control equipment. The Thermal/Vacuum Test Chamber Area (2i) would house a vacuum chamber (2k) capable of holding the RD vehicle and test instrumentation; an isolated test object support fixture; a solar simulator source; and diagnostic and other equipment. It would provide predicted on-orbit vacuum, temperature, and solar exposure based on projected mission profiles. The Thermal/Vacuum Chamber Head Storage Area (2l) would be a 15 x 15-meter (50 x 50-foot) area within the Thermal/Vacuum Chamber Area. It must support the weight of the largest chamber spool and head, and be accessible by the area crane.

The GSE Control Rooms (2m) would contain all equipment required to operate and monitor the test cell. The control center would be a part of each test area and would be accessible from outside the flight hardware PTC cleanroom. All GSE control rooms would require adjacent areas, equal in size to the control room (112 square meters [1,200 square feet]) for signal carrier routing.

The Mission Control Room (2n) would provide complete element or RD vehicle control and monitoring at any test location. Units under test control may consist of test conductor, subsystem, vehicle command, and status consoles and interface to the executive control system. Data processing and acquisition areas would also be provided. The Mission Control Room would require an adjacent area of equal size for signal carrier routing. The Presentation, Communications, and Visitors Center (2o) would serve as a central control station for all communications and a monitoring area that would provide conditions and status of integration and test operations. The area would be a VIP visitor center that would offer controlled audio and video presentations and observation of selected activities from a remote location. The facility would accommodate 100 visitors.

The Administration/Engineering Facility (2r) would provide office and support services space for the professional staff. This staff is expected to be about 65 personnel.

The Support Shops/Labs (2s) would include machine shops, welding shops, paint shops, electrical shops, and instrument calibration and repair labs. In addition, office space would be required for 25 percent of the staff utilizing the facility. The staff would consist of about 38 technical personnel.

The Plant Protection support area (2t) would house the personnel and equipment to provide fire, medical, security, and communication services. Staff for this facility would be about 30 people.

Other miscellaneous requirements for the LTF include a backup power supply. The backup power supply would consist of three 750-kilowatt diesel generators, each with a 757-liter (200-gallon) above-ground fuel tank. In addition, this system would require lead-acid batteries and associated charger and cables.

2.1.3 LTF GENERAL CONSTRUCTION REQUIREMENTS

A construction period of approximately 30 months is anticipated. Construction activities could begin in the second quarter of fiscal year (FY) 01 and continue through the third quarter of FY 03. Construction personnel requirements would average approximately 600 for the first 6 months and 400 for the remaining 24 months.

Initial construction activities after final design would primarily entail site grading. Construction equipment laydown, personal vehicle parking, temporary mobile offices (trailers), maintenance facilities, and other construction needs would occur in previously disturbed areas or in predetermined construction laydown areas in accordance with construction plans to minimize disturbance to the environment. Existing roads would be modified as required to accommodate construction and operations traffic and loads. Earthwork for construction would be performed in accordance with a construction Storm Water Pollution Prevention Plan (SWPPP) and Spill Prevention, Control, and Countermeasures (SPCC) Plan that would be developed for this project. The SWPPP would identify Best Management Practices to be implemented both during and following construction activities for the purpose of preventing soil erosion and controlling pollutant discharges into waterways during storm events. Normal dust suppression methods would be employed to minimize fugitive dust emissions. These methods could include periodic watering, chemical stabilization of exposed inactive areas, and wind speed reduction. Proper tuning and preventative maintenance on construction vehicles would serve to minimize exhaust emissions. (U.S. Environmental Protection Agency, 1999c)

A temporary truck washdown area would be provided within the boundaries of the construction laydown areas. The washdown area would include an impoundment to contain collected wastewater. The impoundment would contain an oil/water separator and a sump that would allow water to be directed to a sanitary sewer.

Approximately 20 hectares (50 acres) of land would be disturbed during construction activities including 16 hectares (40 acres) for the facilities and up to 4 hectares (10 acres) for construction laydown areas. Following site selection and final design, an application would be made to the U.S. Army Corps of Engineers (USACE) for review of Federal dredge and fill requirements in areas that contain wetlands. Depending on final design and grading plans, earth movement would involve approximately 26,760 cubic meters (35,000 cubic yards) of cut and fill material. Unused cut material would be removed from the project

area to an approved spoil site. It is expected that construction material would be transported by truck to the site.

Over the construction period, water use would be as shown in table 2-3 for general activities (for example, site washdown, cement mixing, dust control, and personnel requirements). Wastewater generation would be as shown in table 2-3.

Table 2–3: LTF Construction Water and Wastewater Requirements

Year	Yearly Water Usage in liters (gallons)	Daily Water Usage in liters (gallons)	Yearly Wastewater in liters (gallons)
1	8,233,300 (2,175,000)	32,930 (8,700)	181,700 (48,000)
2	5,110,300 (1,350,000)	20,440 (5,400)	181,700 (48,000)
3	2,555,100 (675,000)	20,440 (5,400)	90,850 (24,000)
Total	15,898,700 (4,200,000)		454,250 (120,000)

In addition, approximately 1,360 metric tons (1,500 tons) of solid waste would be generated during the construction period. Removal of construction debris would be the responsibility of the construction contractor. Any hazardous material identified or hazardous waste generated during construction would be handled in accordance with applicable regulations.

The construction phase would generate an average of 800 vehicle trips per day and 10 truck trips per day (Ballistic Missile Defense Organization, 1998b). A Notice of Proposed Construction would be filed with the Federal Aviation Administration (FAA) to accommodate buildings that are greater than 61 meters (200 feet) in height.

2.1.4 LTF SITE OPERATIONS

An operations period of approximately 24 months is anticipated. Follow-on activities have not been defined in sufficient detail to be considered in this document. Additional environmental documentation would be required to support additional operations. LTF site operations could begin in the fourth quarter of FY 03 and continue through the fourth quarter of FY 05. Approximately 165 persons would be needed to operate the facility. Table 2-4 summarizes the monthly operations utility requirements for the LTF site.

Table 2–4: LTF Monthly Operational Utility Requirements

Water in liters (gallons)	Wastewater in liters (gallons)	Solid Waste in metric tons (tons)	Electricity in kilowatt hours	Natural Gas in therms
568,000 (150,000)	272,550 (72,000)	45 (50)	250,000	1,000

Operations would include the following steps:

- Receive individual elements
- Test and assemble satellite elements
- Conduct acoustic, environmental, and performance tests of the assembled LPE
- Conduct acoustic, environmental, and performance tests of the assembled RD integrated vehicle

Individual elements would be shipped via commercial or DOD carrier from the manufacturing location and would arrive at the I&T Complex where they would undergo testing. The elements would then be assembled to form the LPE. The LPE would undergo acoustic and thermal testing at the I&T Complex before being moved to the PTC Complex. The final integration would take place at the PTC Complex.

The fully integrated LPE would then undergo performance testing. The low-power laser would be started for PTC initial alignments at atmospheric conditions. This system would have its own vacuum and scrubber. The next step in the performance test would be to load the LPE with chemical reactants. Diesel fuel would be used to heat water to create steam. Operation of the steam boilers would be incorporated into the appropriate Title V or other Air Permit. Steam generators would then be started at the beginning of the test sequence and would be exhausted through the PRS, a multi-stage steam ejector pumping system that would create a vacuum to remove exhaust gas from the PTC. The PRS would operate for approximately 100 seconds before the high power laser operation begins. Operation of the high power laser would then begin and continue for approximately 60 seconds. The exhaust products of the laser generation would be exhausted into the PRS. The lased beam would be directed into diagnostic instruments and into a beam dump.

The steam generators and PRS would continue running during the laser operation and for approximately 40 seconds after laser shut-down. Following laser shut-down, the system would be purged of any remaining reactants by blowing an inert gas such as nitrogen or helium through the lines to push the residual substance out of the system or dilute it to acceptable levels.

Approximately 16 tests would be conducted for the LPE. Table 2-5 lists the anticipated performance test emissions per test.

After LPE testing, the PTC would be expanded to allow the Optical Payload Element and Spacecraft Element to be installed on the LPE to create the RD vehicle. These activities and the testing would follow similar steps as described above for the LPE. Approximately 12 tests would be conducted for the RD vehicle.

Table 2-6 provides the types and amounts of hazardous materials that would be used and hazardous waste that would be generated at the LTF. All hazardous materials used and waste generated would be handled in accordance with applicable Federal, state, and local

Table 2–5: LTF Performance Test Emissions

Chemical/ Compound	Storage in kilograms (pounds)	Passivate in kilograms (pounds)			Test (60 seconds) in kilograms (pounds)			Purge in kilograms (pounds)		
		Used	Made	Exhausted	Used	Made	Exhausted	Used	Made	Exhausted
Deuterium (D_2)	612 (1,350)	0 (0)	0 (0)	0 (0)	32 (71)	24 (52)	24 (52)	0.04 (0.08)	0 (0)	0.08 (0.08)
Diesel	56,780 liters (15,000 gallons)	0 (0)	0 (0)	0 (0)	13,250 liters (3,500 gallons)	0 (0)	0 (0)	0 (0)	N/A	N/A
Fluorine (F_2)	10 (21)	5 (11)	5 (11)	0.24 (0.55)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Helium (He)	2,286 (5,040)	0.9 (2)	0.9 (2)	0.9 (2)	39 (85)	39 (85)	39 (85)	0.04 (0.08)	0 (0)	0.04 (0.08)
Hydrogen (H_2)	336 (740)	0 (0)	0 (0)	0 (0)	32 (71)	28 (61)	028 (61)	0.02 (0.04)	0 (0)	0.02 (0.04)
Hydrogen Fluoride (HF)	N/A	0 (0)	0 (0)	0 (0)	0 (0)	186 (411)	10 (21)	0 (0)	0 (0)	0 (0)
Nitrogen (N_2)	39,917 (88,000)	0.4 (1)	0.4 (1)	0.4 (1)	907 (2,000)	43 (94)	950 (2,094)	0.06 (0.14)	0 (0)	0.06 (0.14)
Nitrogen Trifluoride (NF_3)	3,184 (7,020)	0 (0)	0 (0)	0 (0)	216 (476)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Water for PRS -	359,614 liters (95,000 gallons)	0 (0)	0 (0)	0 (0)	359,614 liters (95,000 gallons)	302,833 liters (80,000 gallons) (recovered)	56,781 liters (15,000 gallons)	0 (0)	0 (0)	0 (0)
Sodium Hydroxide (NaOH)	833 liters (220 gallons)	0 (0)	0 (0)	0 (0)	208 liters (55 gallons)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Source: Ballistic Missile Defense Organization, 1999.

regulations and installation pollution prevention and hazardous materials management plans. Any spill of these materials would be managed in accordance with the project SPCC Plan that would be developed following installation-specific procedures. The SPCC Plan would establish responsibility, outline personnel duties, and provide resource/guidelines for use in the control, clean-up, and emergency response for spills of LTF hazardous material or waste. The SPCC Plan would also establish a documentation program and indicate the regulatory reporting and notification requirements.

Table 2-6: LTF Hazardous Materials and Hazardous Waste

Hazardous Material	Average Annual Amount Used in kilograms (pounds)	Hazardous Waste	Average Annual Amount Generated in kilograms (pounds)
Solvents	2,500 liters (660 gallons)	Waste paint and related materials	215 (473)
Fluorine	1,262 (2,783)	Corrosive contaminated water	3,589 (7,913)
Nitrogen Trifluoride	3,901 (8,602)	Waste alcohol	24.5 (54)
Hydrogen/Deuterium	836 (1,844)	Waste acid	54 (119)
Sulfur Hexafluoride	277 (611)	Waste base	120 (265)
Oxygen	107 (237)	Waste ethylene glycol	123 (270)
Sodium Hydroxide	3,330 liters (880 gallons)	Batteries	67 (148)
Acids	900 liters (238 gallons)	Hydrofluoric acid-contaminated vacuum oil	954 liters (252 gallons)

The operations phase would generate approximately 240 vehicle trips per day and 1 truck trip per day (Ballistic Missile Defense Organization, 1998b). At the end of the LTF operations described herein, the RD vehicle could be transported to another location. Due to the size of the vehicle, a barge could be necessary.

2.1.5 LTF SAFETY CONSIDERATIONS

Laser Test Facility Safety Systems

Specific safety plans would be developed to ensure that LTF operations are conducted in a safe manner and in compliance with applicable regulations, as specified in numerous compliance documents including the following:

- DOD Standard 6055.9, *Ammunition and Explosive Safety Standards*
- National Fire Protection Association, *National Fire Codes*
- American National Standards Institute
- Occupational Safety and Health Administration (OSHA)
- Laser Safety Documents

Overall safety regulations and procedures would follow those of the host installations where the LTF would be located. The objective of the safety program is to ensure that the general public, onsite personnel, and site area resources are provided an acceptable level of safety, and that all aspects of operations adhere to public law.

The LTF would have a Safety Office to train site personnel on the hazardous chemicals kept at the site, confined space entry, and hazardous materials spill response in case of an emergency. The Safety Office would also maintain Material Safety Data Sheets for hazardous chemicals used onsite. Hazardous chemicals that would be maintained at the site would be monitored 365 days a year, 24 hours a day, by site surveillance teams as well as the Hazardous Atmospheric Monitoring Detection System.

The LTF would include a Hardwire Abort System that would consist of multiple software, hardware, and man-in-loop aborts. In the event of a system failure or out-of-spec operations, the system would either be automatically or manually shut down. In the event of an emergency, site surveillance personnel would follow written procedures to alert appropriate personnel and to correct the emergency. These procedures would be outlined in a Disaster Preparedness Plan or similar range document and updated annually. During laser operations testing, medical and fire safety and the host installation Safety Office would be on alert. An emergency announcing system would be provided on a dedicated intercom net throughout the LTF. Overall safety procedures for testing would be developed using safety procedures implemented for similar laser systems currently operating in the United States.

The LTF would emit small amounts of potentially hazardous gases during various operations (table 2-5). These gases include the release of hydrogen fluoride and unreacted starting chemicals from the PRS during lasing and the emission of fluorine during passivation, or chemical treating of the system. Warning stakes located at a 100-meter (328-foot) radius from the PRS exhaust release point would be spaced no greater than 10 meters (33 feet) apart. These warning stakes would be in English and Spanish and would state that entry beyond this point is restricted due to toxic gas hazards. The system would comply with American National Standards Institute Z136.1, *American National Standard for the Safe Use of Lasers*.

Fire Protection System

Fire protection, alarm, and fire suppression systems would be provided for all support areas, in accordance with the applicable sections of the National Fire Protection Association National Fire Codes, standards, and practices. The alarm system would notify the host installation's Fire Department.

Security

Security requirements are an integral component of project safety. Security measures would be incorporated within the project design and through operational procedures. Elements of site security would include a perimeter security fence, clear zone, security lighting, security standby power, intrusion detection system, and security patrol roads.

Procedures for security include the use of entry controllers, alarm monitors, alarm/security response teams, radios, and vehicles.

Laser Safety Zone

A 1.2-kilometer (0.75-mile) radius Laser Safety Zone would be established around the PTC for areas that could be potentially affected by accidents with the reactants used in the laser system during a test. Loading of reactants at the onset of a test would not be allowed if an undue hazard exists to persons and property because of potential dispersion of hazardous materials. Prior to operations involving reactants, a dispersion computer model would be used to determine the toxic hazard corridor. If the toxic hazard corridor encompasses any unprotected areas, the operation would be put on hold until more favorable meteorological conditions exist. The area within the Laser Safety Zone would be verified clear of personnel prior to initiating a test. Explosive Safety Quantity-Distance (ESQD) criteria would be used to establish safe distances for facilities with an explosive potential to non-related facilities. The distance criteria have been established by DOD safety standards. Figure 2-7 provides the safety area distances required for LTF facilities.

Transportation Safety

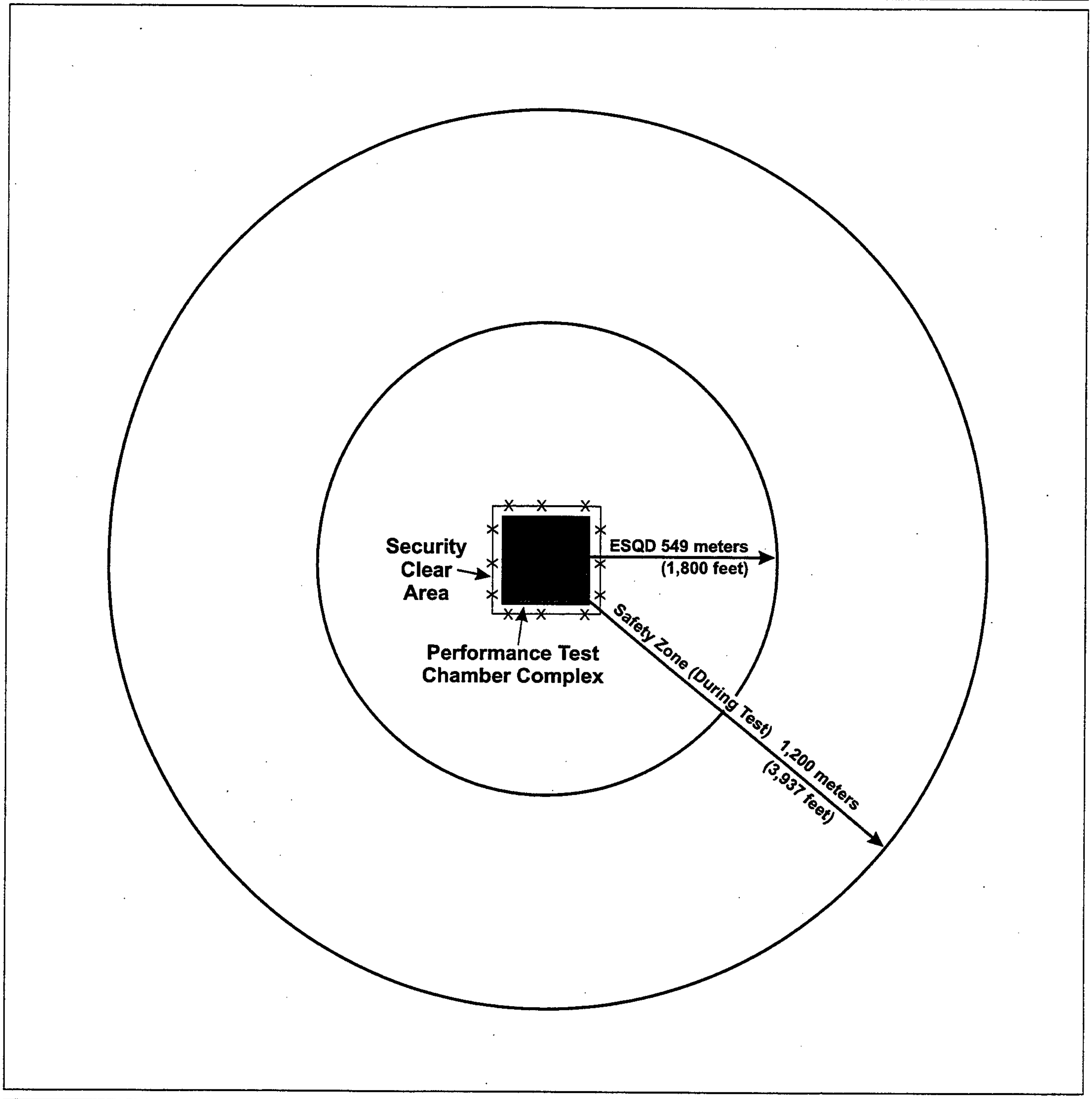
The reactants and other hazardous materials that would be used at the LTF would be shipped via truck from the manufacturing location. Transportation of hazardous materials would be accomplished in accordance with Department of Transportation (DOT) regulations for interstate shipment of hazardous substances (49 CFR Parts 100-199). These regulations require that hazardous materials be shipped in specially designed shipping containers to reduce the potential of a mishap in the event of an accident. In addition, shipments would follow state designated hazardous materials transportation routes. Upon arrival at an installation, installation-specific procedures would also be followed.

2.2 PROPOSED ACTION ALTERNATIVE LOCATIONS

The four locations under consideration for the LTF are Cape Canaveral AS, Florida; KSC, Florida; RSA, Alabama; and SSC, Mississippi (figures 1-1 and 1-2). The following sections describe the proposed layout of facilities at each of the four locations.

2.2.1 CAPE CANAVERAL AS, FLORIDA

The proposed Cape Canaveral AS alternative includes the PTC Complex at Launch Complex (LC) -15, with the I&T Complex in the vicinity of Building 54445 as shown on figure 2-8. Table 2-7 provides a summary of the site layout land requirements.



EXPLANATION

-x-x- Security Fence

ESQD = Explosive Safety Quantity Distance

Not to Scale

LTF Safety Arcs

Figure 2-7

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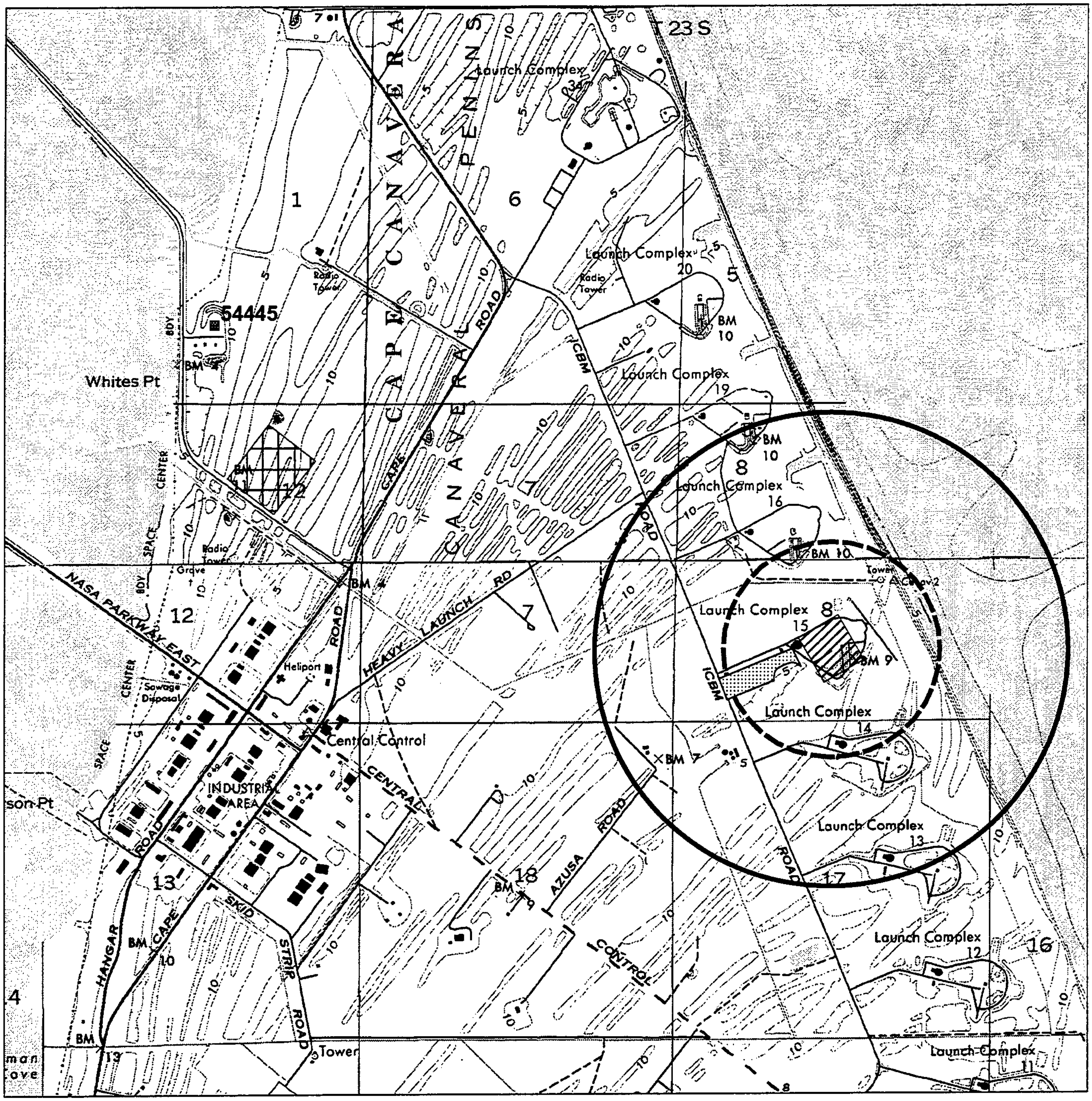

EXPLANATION

- ESQD 549 meters (1,800 feet)
- Safety Zone 1,207 meters (3,960 feet)
- PTC Complex
- I&T Complex
- Facilities Available for LTF
- Temporary Construction Laydown Area

PTC - Performance Test Chamber
I&T - Integration and Test

NORTH

Scale 1:30,000

0 381 762 Meters

0 1250 2500 Feet

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LTF Site Location Map

Cape Canaveral, Florida

Figure 2-8

Table 2–7: Cape Canaveral Alternative Land Requirements

Category	Land Requirement in hectares (acres)
Cape Canaveral Property Total Area	6,394 (15,800)
Proposed PTC Complex/Previously Disturbed Land	1.7 (4.2)
Proposed PTC Complex/Previously Undisturbed Land	4.4 (10.8)
Proposed I&T Complex/Previously Disturbed Land	1.0 (2.5)
Proposed I&T Complex/Previously Undisturbed Land	9.1 (22.5)
Proposed Construction Laydown Area/Previously Disturbed Land	0.4 (1)
Proposed Construction Laydown Area/Previously Undisturbed Land	3.6 (9)

Existing Facilities

An existing facility that could be used for assembly purposes is the high bay building (Building 54445). Modifications to the facility are not anticipated.

New Facilities

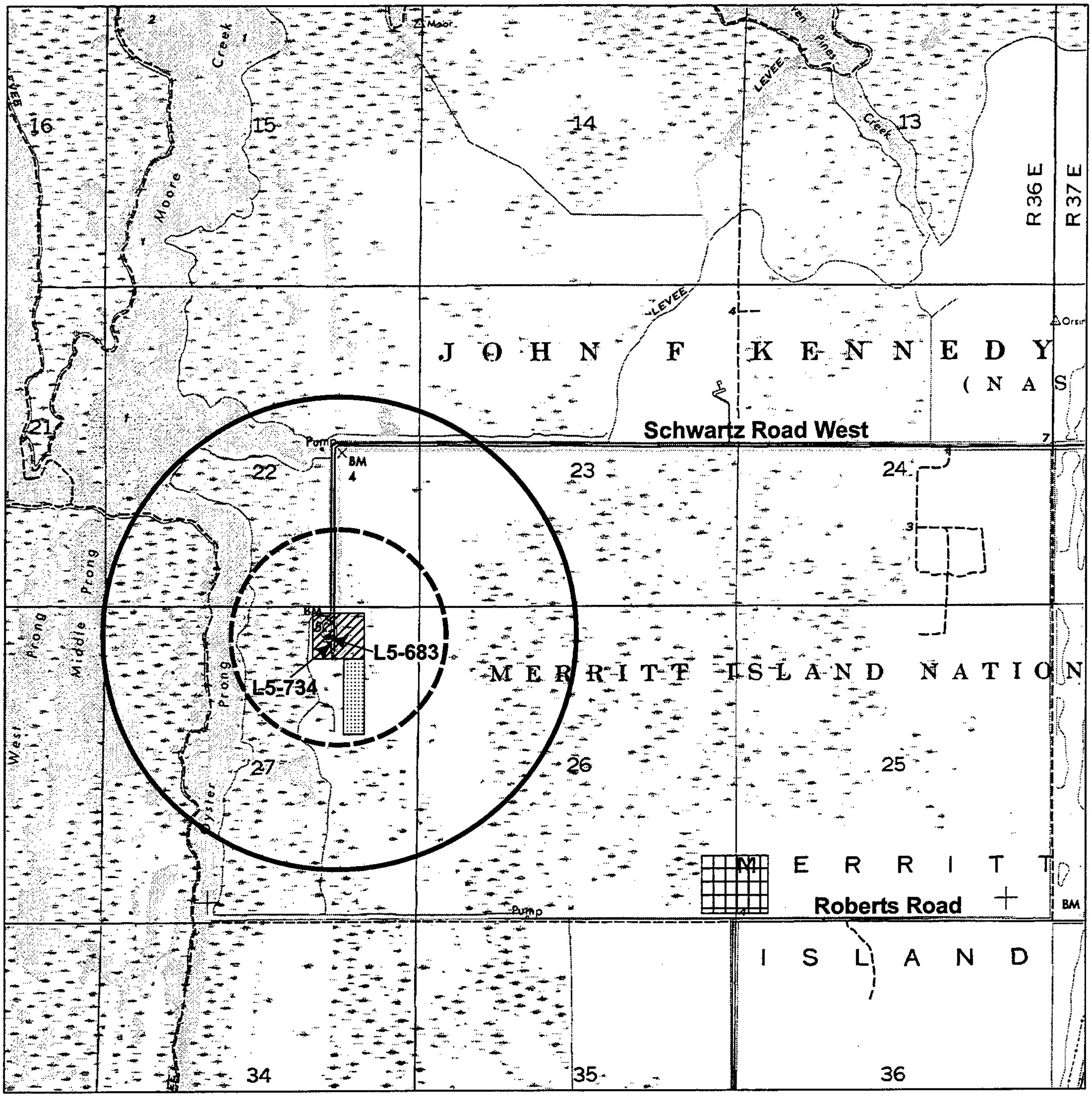
Most of the facilities requirements identified in table 2-1 would be new construction at the proposed PTC and I&T Complex areas.

2.2.2 KSC, FLORIDA

The proposed KSC alternative includes the PTC Complex at the end of Schwartz Road West with the I&T north of Roberts Road as shown in figure 2-9. Table 2-8 provides a summary of the site layout land requirements.

Table 2–8: Kennedy Space Center Alternative Land Requirements

Category	Land Requirement in hectares (acres)
KSC Property Total Area	56,450 (139,490)
Proposed PTC Complex/Previously Disturbed Land	0.5 (1.2)
Proposed PTC Complex/Previously Undisturbed Land	5.6 (13.8)
Proposed I&T Complex/Previously Disturbed Land	1.1 (2.8)
Proposed I&T Complex/Previously Undisturbed Land	9.0 (22.2)
Proposed Construction Laydown Area/Previously Undisturbed Land	4.0 (10)



EXPLANATION

ESQD 549 meters (1,800 feet)
Safety Zone 1,207 meters (3,960 feet)
PTC Complex
I&T Complex

Temporary Construction Laydown Area

PTC - Performance Test Chamber
I&T - Integration and Test

Scale 1:30,000
0 381 762 Meters
0 1250 2500 Feet
NORTH

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LTF Site Location Map

Kennedy Space Center, Florida

Figure 2-9

Existing Facilities

Buildings L5-734 and L5-683 would be demolished in accordance with applicable regulations.

Existing facilities that could be used include high bay areas at the Multi-Payload Processing Facility (M7-1104) and Payload Hazardous Servicing Facility (M7-1354). Modifications to these facilities are not anticipated.

New Facilities

Most of the facilities requirements identified in table 2-1 would be new construction at the proposed PTC and I&T Complex areas. Both Schwartz Road West and Roberts Road would require upgrading to accommodate construction and operations traffic and load requirements. Construction would generally be contained within previously disturbed areas. Culverts would be utilized to maintain existing drainage requirements.

2.2.3 RSA, ALABAMA

The proposed RSA alternative includes the PTC Complex along Blueberry Road, with the I&T Complex in the vicinity of Building 8027, north of Buxton Road as shown on figure 2-10. Table 2-9 provides a summary of the site layout land requirements.

Table 2–9: Redstone Arsenal Alternative Land Requirements

Category	Land Requirement in hectares (acres)
RSA Property Total Area	15,342 (37,910)
Proposed PTC Complex/Previously Disturbed Land	0.3 (0.7)
Proposed PTC Complex/Previously Undisturbed Land	5.8 (14.3)
Proposed I&T Complex/Previously Disturbed Land	1.9 (4.7)
Proposed I&T Complex/Previously Undisturbed Land	8.2 (20.3)
Proposed Construction Laydown Area/Previously Undisturbed Land	4.0 (10)

Existing Facilities

An existing facility that could be used for administrative purposes is Building 8027, which is adjacent to the proposed I&T Complex (figure 2-10). Minor modifications could be required.

New Facilities

Most of the facilities requirements identified in table 2-1 would be new construction at the proposed PTC and I&T Complex areas.

EXPLANATION

- ESQD 549 meters (1,800 feet)
- Safety Zone 1,207 meters (3,960 feet)
- Redstone Arsenal Boundary
- PTC Complex
- I&T Complex
- Facilities Available for LTF
- Temporary Construction Laydown Area

PTC - Performance Test Chamber
I&T - Integration and Test

Scale 1:30,000

0 381 762 Meters

0 1,250 2,500 Feet

NORTH

LTF Site Location Map

Redstone Arsenal, Alabama

Figure 2-10

0017ltf

2.2.4 SSC, MISSISSIPPI

The proposed SSC alternative includes the PTC Complex east of the junction of Andrew Jackson and Flat Top roads, with the I&T Complex located north of the junction of Flat Top and Moses Cook roads as shown on figure 2-11. All proposed LTF facilities would be located within the Mississippi Army Ammunition Plant (MSAAP) boundary. The MSAAP is located on the north half of the SSC. The MSAAP is an autonomous facility owned by the U.S. Army and maintained according to U.S. Army standards. Although the MSAAP land is owned by NASA, it is provided to the U.S. Army under terms of a 50-year renewable, irrevocable use and occupancy permit. Table 2-10 provides a summary of the proposed site layout land requirements.

Table 2–10: Stennis Space Center Alternative Land Requirements

Category	Land Requirement in hectares (acres)
Stennis Property Total Area	5,585 (13,800)
MSAAP Property Total Area	1,755 (4,337)
Proposed PTC Complex/Previously Disturbed Land	0.1 (0.2)
Proposed PTC Complex/Previously Undisturbed Land	5.9 (14.6)
Proposed I&T Complex/Previously Disturbed Land	0.1 (0.3)
Proposed I&T Complex/Previously Undisturbed Land	10.0 (24.7)
Proposed Construction Laydown Area/Previously Undisturbed Land	4.0 (10)

Existing Facilities

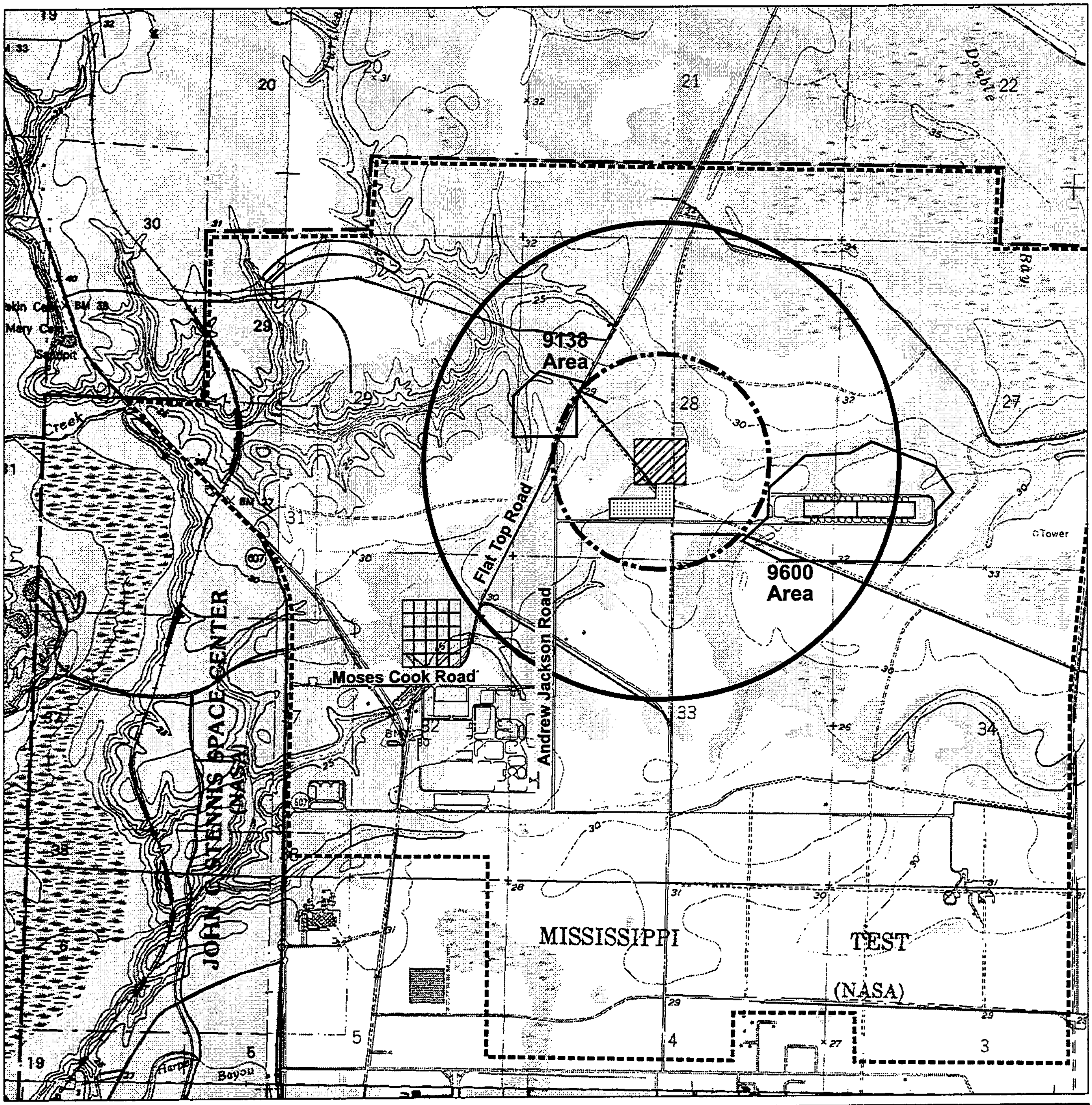
Existing facilities that could be used have not been identified.

New Facilities

The facilities requirements identified in table 2-1 would be new construction at the proposed PTC and I&T Complex areas.

2.3 GROUND SUPPORT EQUIPMENT MANUFACTURING

To support construction and operation of the LTF, the GSE, such as the test chamber, would be manufactured at industrial facilities prior to being installed at the LTF. The major U.S. Government facilities, subcontractors, and their responsibilities for manufacturing the various components have not been identified at this time. Although this equipment would not be considered commercial-off-the-shelf, it would be manufactured at locations that routinely use similar materials and processes. All manufacturing would be conducted in accordance with applicable laws and regulations.



EXPLANATION

- ESQD 549 meters (1,800 feet)
- Safety Zone 1,207 meters (3,960 feet)
- Stennis Space Center Boundary
- Mississippi Army Ammunition Plant Boundary
- PTC Complex
- I&T Complex
- Temporary Construction Laydown Area

PTC - Performance Test Chamber
I&T - Integration and Test

Scale 1:30,000
0 381 762 Meters
0 1250 2500 Feet
NORTH

LTF Site Location Map

Stennis Space Center, Mississippi

Figure 2-11

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2.4 NO-ACTION ALTERNATIVE

Under the No-action Alternative, there would be no construction of a new LTF. There would be no means of full power laser testing of a large, integrated RD. There would be no LTF activities at the Proposed Action alternative locations; however, there could be some ongoing SBL-related programs at those locations. The proposed LTF site at each candidate location would continue in its present or planned use as described in installation master plans.

Ongoing activities at Cape Canaveral AS would continue in accordance with the *Cape Canaveral Air Station, Florida, General Plan/Comprehensive Plan* (Cape Canaveral Air Station 45th Space Wing, 1996). An existing building at LC-15 would continue to be used for office space, and ongoing Installation Restoration Program (IRP) clean-up activities would continue. The proposed I&T site would continue to be an unused area. These activities would continue in operation, sustaining current levels of environmental effects.

Ongoing activities at KSC would continue in accordance with the *Facilities Master Plan, Volume 1, John F. Kennedy Space Center* (National Aeronautics and Space Administration, 1992). Existing Building L5-683 would continue to be used to house feral cats caught on base. The proposed I&T site would continue to be an unused area.

Ongoing activities at RSA would continue in accordance with the *Master Plan Narrative for Redstone Arsenal, Alabama* (Redstone Arsenal, 1989). Existing storage igloos would continue to be used. Building 8027 is currently vacant but could be used for office space. The remainder of the proposed I&T site would continue to be an undeveloped area.

Ongoing activities at SSC would continue in accordance with the *John C. Stennis Space Center Facilities Master Plan* (National Aeronautics and Space Administration, 1997d). The MSAAP mission is to fully occupy and utilize all existing MSAAP facilities with tenant activities. MSAAP is currently contracted with 22 tenants with over 700 people and ongoing negotiations will increase to 1,000 people by FY 00. Tenant activities in the MSAAP 9600 area and 9138 building, which are the only MSAAP areas impacted by the proposal, are very minimal and are easily postponed and rescheduled. The proposed I&T site would continue to be an undeveloped area.

2.5 ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD

2.5.1 SITE NARROWING

Exclusionary criteria, developed from BMDO Directed Energy Directorate guidelines, were applied to over 3,000 installations, including both DOD and NASA facilities. Approximately 100 installations met all the requirements established by the exclusionary criteria. It was not feasible, within schedule and funding constraints, to visit all sites that

had passed the exclusionary criteria. Site Screening Criteria were developed to evaluate the locations based on information from available databases. The four highest scoring locations were then identified as Proposed Action alternative locations.

The following sections discuss the basis for the development of the exclusionary and screening criteria that were used to narrow the potential list of locations from more than 3,000 to the four locations recommended for site evaluation.

2.5.1.1 Exclusionary Criteria

a. The facility will be sited on U.S. Government property located within the Continental United States.

   Rationale: The LTF provides significant test capability and could be considered a national asset. As such, it should be located to provide reasonable access from major test laboratories. In addition, three rounds of base closure demonstrate the desire of DOD to reduce real estate, and where possible, maximize use of existing government assets.

b. The facility will be sited within an installation that is not farther than 8 kilometers (5 miles) from a commercially navigable waterway.

   Rationale: Program guidelines require the option of shipment of the space vehicle from the LTF to the launch site by barge. This requires that the vehicle be delivered to a barge on a navigable waterway with access to either the Gulf of Mexico or the Atlantic Ocean. The size of the space vehicle will require special handling, and it is anticipated that land transportation will be extremely slow. Some of this travel will be by public roads and highways. To minimize the impact of such transport to the public, it is desirable to limit road transport to the distance that can be covered in an 8-hour period, during the hours of 10:00 p.m. to 6:00 a.m. Based on the experience of transporting similar objects with similar vehicles, a planning speed of 1 kilometer (0.6 mile) per hour was used. Using these parameters, 8 kilometers (5 miles) is the maximum distance that the transporter could be expected to travel in an 8-hour period.

c. Minimum installation size will be 526 contiguous hectares (1,300 contiguous acres).

   Rationale: The primary existing laser test facility at San Juan Capistrano, California, is a smaller facility, but utilizes a buffer zone of 0.8-kilometer (0.5-mile) radius. Based on the expected operational parameters of the SBL, the buffer zone requirement has been expanded to a 1.2-kilometer (0.75-mile) radius. This requirement considers the worst operating case when evaluating potential air emissions following test operations, explosive considerations, and noise potential.

d. Facilities will not be constructed on, or within, National Parks, National Monuments, wilderness areas, national recreation areas, wild/scenic river systems, national historic sites, or wetlands unless existing environmental mitigation programs are in place.

   Rationale: The program intent is to minimize impacts on the environment and to comply with laws, regulations, and policy restricting use or activity in environmentally sensitive areas.

2.5.2 SITE SCREENING EVALUATIVE CRITERIA

Application of the exclusionary criteria narrowed the potential list of facilities from approximately 3,000 to 100. Next, seven quantitative screening criteria were applied to the remaining list of approximately 100 government sites. This process is summarized below. The seven screening criteria were selected based on criticality to site selection, construction, operation, and the availability of information from readily accessed databases. Table 2-11 lists the criteria and their relative weights.

Table 2-11: LTF Site Screening Criteria

Criteria	Weight (%)
1. Similarity of installation mission	25
2. Total population within 80 kilometers (50 miles)	21
3. Total installation size	17
4. Distance to launch site	16
5. Area cost factor	10
6. Seismic zone	8
7. Distance to commercial airport	3

Total weighted scores for the 100 remaining locations ranged from 787 to 40. There was a clear break between Quantico Marine Corps Base, Virginia (653), and the next location, Fort A.P. Hill, Virginia (586). However, these two installations scored very low in mission similarity and were dropped from further consideration. The top two DOD locations, Cape Canaveral AS and RSA, were selected for site evaluation.

Two NASA sites rose to the top of the list as potential locations for the LTF. SSC and KSC had scores similar to the top two DOD sites, and were therefore selected for site evaluation.

2.6 COMPARISON OF ENVIRONMENTAL IMPACTS

A summary comparison of the environmental impacts at Cape Canaveral AS, KSC, RSA, and SSC for each resource affected by the alternatives over the study period is presented in table 2-12. Impacts to the environment are described briefly in the summary and discussed in detail in chapter 4.0.

Table 2-12: Summary of Environmental Impacts for the Laser Test Facility

Resource Category	No-action Alternative	Cape Canaveral AS	KSC	RSA	SSC
Air Quality	No impact All areas are in attainment and in compliance with Installation Title V permits where applicable	No exceedance of air quality standards of criteria pollutants or health-based standards of non-criteria pollutants would be anticipated beyond the immediate construction area or operations safety zone Operational emissions would be incorporated into the Cape Canaveral AS Title V Air Permit	Impacts would be similar to those anticipated at Cape Canaveral AS Emissions would be incorporated into the KSC Title V Air Permit	Impacts would be similar to those anticipated at Cape Canaveral AS Emissions would be incorporated into the RSA Title V Air Permit	Impacts would be similar to those anticipated at Cape Canaveral AS The LTF would obtain an operating permit that would incorporate all operational emissions
Airspace	No impact Airspace use would continue in accordance with Federal Aviation Administration (FAA) regulations	Notice of Proposed Construction to FAA required; no impact anticipated	Notice of Proposed Construction to FAA required; no impact anticipated	Notice of Proposed Construction to FAA required; no impact anticipated	Notice of Proposed Construction to FAA required; no impact anticipated
Biological Resources	No impact T&E species protected by Natural Resources management practices	Displaced wildlife from vegetation removal. Localized and short-term startle effects from noise and human presence. Potential for minor and temporary pH reduction No wetlands would be impacted	Displaced wildlife from vegetation removal. Localized and short-term startle effects from noise and human presence. Potential for minor and temporary pH reduction The potential exists to impact 10 hectares (25 acres) of wetlands The potential exists for impacts to management activities such as scrub habitat maintenance Increase in the potential injury of wildlife by vehicles	Displaced wildlife from vegetation removal. Localized and short-term startle effects from noise and human presence. Potential for minor and temporary pH reduction No wetlands would be impacted	Displaced wildlife from vegetation removal. Localized and short-term startle effects from noise and human presence. Potential for minor and temporary pH reduction The potential exists to impact 20 hectares (50 acres) of wetlands The potential exists for impacts to management activities such as scrub habitat maintenance

Table 2-12: Summary of Environmental Impacts for the Laser Test Facility (Continued)

Resource Category	No-action Alternative	Cape Canaveral AS	KSC	RSA	SSC
Cultural Resources	No impact Cultural resources would continue to be monitored by the installation environmental office in coordination with the SHPO	No impact	No impact	Site 1Ma 630 would be damaged by construction. Based on consultation with the SHPO, a Phase II survey would be required as an initial mitigation	No impact
Geology and Soils	No impact The soils at each location would remain in their current state	Short-term impacts from soil erosion during construction	Short-term impacts from soil erosion during construction	Short-term impacts from soil erosion during construction	Short-term impacts from soil erosion during construction
Hazardous Materials and Hazardous Waste Management	No impact Existing procedures and plans would be followed for ongoing activities at each location. No additional hazardous materials/hazardous waste would occur at the LTF sites	Increase in hazardous materials use and hazardous waste generation. All hazardous material and waste handled in accordance with appropriate regulations, and would not adversely affect existing permits or programs at Cape Canaveral AS	Impacts would be similar to those described for Cape Canaveral AS	Impacts would be similar to those described for Cape Canaveral AS	Impacts would be similar to those described for Cape Canaveral AS

Table 2-12: Summary of Environmental Impacts for the Laser Test Facility (Continued)

Resource Category	No-action Alternative	Cape Canaveral AS	KSC	RSA	SSC
Health and Safety	No impact Existing procedures and plans would be followed for ongoing activities at each installation	No increased hazards to the public. Worker risk within guidelines, however operations at LC-13, LC-14, LC-16, and LC-19 would have to be suspended and personnel evacuated when the Laser Safety Zone is active. The ESQD associated with the PTC Complex site would restrict the use of portions of LC-14 and LC-16. Potential for a mishap during handling is unlikely. In the event of an unlikely accidental leak, the Risk Management Plan required by the Clean Air Act, section 112(r) would address the immediate response to be taken in order to minimize the impact on the populace and the environment	No increased hazards to the public. Worker risk within guidelines. Potential for a mishap during handling is unlikely. In the event of an unlikely accidental leak, the Risk Management Plan required by the Clean Air Act, section 112(r) would address the immediate response to be taken in order to minimize the impact on the populace and the environment	No increased hazards to the public. Worker risk within guidelines. Potential for a mishap during handling is unlikely. In the event of an unlikely accidental leak, the Risk Management Plan required by the Clean Air Act, section 112(r) would address the immediate response to be taken in order to minimize the impact on the populace and the environment	No increased hazards to the public. Worker risk within guidelines, however operations at the 9600 area and building 9138 would be postponed and/or rescheduled when the Laser Safety Zone is active. Potential for a mishap during handling is unlikely. In the event of an unlikely accidental leak, the Risk Management Plan required by the Clean Air Act, section 112(r) would address the immediate response to be taken in order to minimize the impact on the populace and the environment

Table 2-12: Summary of Environmental Impacts for the Laser Test Facility (Continued)

Resource Category	No-action Alternative	Cape Canaveral AS	KSC	RSA	SSC
Land Use and Aesthetics	No impact Use of the areas would comply with existing land use plans	LTF construction would be compatible with regional and local planning/zoning and surrounding off base land uses. Operations at LC-13, LC-14, LC-16, and LC-19 would have to be suspended and personnel evacuated when the Laser Safety Zone is active. The ESQD associated with the PTC Complex site would restrict the use of portions of LC-14 and LC-16 Personnel at the LTF would also have to be evacuated during launch activities at other complexes, such as CX 36	LTF construction and operation would be compatible with surrounding off base land uses; however, specific site planning zones may need to be established to ensure compatibility Approximately 16 hectares (40 acres) of Wildlife Refuge would be transferred to KSC, resulting in impacts on management of the MINWR; additional studies required	LTF construction and operation would be compatible with installation and surrounding off base land uses Approximately 5 storage igloos would be taken out of service. Other Igloos would be inaccessible when the Laser Safety Zone is active	LTF construction and operation would be compatible with installation and surrounding off base land uses Tenant organization operations within the 9600 area and building 9138 would be postponed and/or rescheduled when the Laser Safety Zone is active
Noise	No impact Minimal noise levels would continue	Noise levels would be less than 85 dB at the safety zone boundary	Same as Cape Canaveral AS	Same as Cape Canaveral AS	Same as Cape Canaveral AS
Socioeconomics	No economic benefit from LTF	Construction and operations direct and indirect employment and materials expenditures would provide economic benefit to surrounding communities retail sales and tax base. No impact on public services is expected	Impacts would be similar to those described for Cape Canaveral AS	Impacts would be similar to those described for Cape Canaveral AS	Impacts would be similar to those described for Cape Canaveral AS

Table 2-12: Summary of Environmental Impacts for the Laser Test Facility (Continued)

Resource Category	No-action Alternative	Cape Canaveral AS	KSC	RSA	SSC
Transportation	No impact Transportation resources would continue at their current levels. No road upgrades or construction would occur at the LTF sites	Some increase in traffic during construction and operation. Total average daily traffic would remain within the design limits for each roadway.	Impacts would be similar to those described for Cape Canaveral AS Substantial upgrading of Schwartz Road West and Roberts Road would be required to accommodate construction traffic, resulting in impacts to current users	Impacts would be similar to those described for Cape Canaveral AS. Widening of Blueberry Road would be required.	Impacts would be similar to those described for Cape Canaveral AS
Utilities	No impact Current utility systems would continue to be used	Current utility systems have adequate capacity to support construction and operation	Same as described for Cape Canaveral AS	Same as described for Cape Canaveral AS	Same as described for Cape Canaveral AS
Water Resources	No impact Water resources would continue to be managed in accordance with applicable laws, regulations, and existing permits	Minor potential for short-term sediment increase in surface water during construction. Appropriate permits and storm water plans would be implemented to minimize impacts to water resources	Impacts would be similar to those described for Cape Canaveral AS	Impacts would be similar to those described for Cape Canaveral AS	Impacts would be similar to those described for Cape Canaveral AS
Environmental Justice	No impact	No disproportionate low-income or minority populations would be impacted	Impacts would be similar to those described for Cape Canaveral AS	Impacts would be similar to those described for Cape Canaveral AS	Impacts would be similar to those described for Cape Canaveral AS

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3.0 Affected Environment

3.0 AFFECTED ENVIRONMENT

This section describes the environmental characteristics that may be affected by the Proposed Action at each potential RD vehicle LTF alternative site. The affected environment is described succinctly in order to provide a context for understanding the potential impacts. Those components of the affected environment that have the greatest potential for impacts are described in greater detail.

Available literature (such as EAs, environmental impact statements, and base master plans) was acquired, and data gaps (questions that could not be answered from the literature) were identified. To fill the data gaps and to verify and update available information, installation personnel and Federal, state, and local regulatory agencies were contacted. Cited literature, telephone interviews, and other referenced material are presented in section 5.0.

Fourteen broad environmental components were considered to provide a context for understanding the potential effects of the Proposed Action and to provide a basis for assessing the severity of potential impacts. Several of these environmental components are regulated by Federal and/or state environmental statutes, many of which set specific guidelines, regulations, and standards (appendix C). These standards provide a benchmark that assists in determining the significance of environmental impacts under the NEPA evaluation process. The compliance status of each potential site, with respect to environmental requirements, was included in the information collected on the affected environment. The 14 areas of environmental consideration, discussed briefly as follows, are: air quality, airspace, biological resources, cultural resources, geology and soils, hazardous materials and hazardous waste, health and safety, land use and aesthetics, noise, socioeconomics, transportation, utilities, water resources, and environmental justice.

For each resource, a region of influence (ROI) is defined to determine the geographic area to be addressed as the affected environment.

3.1 CAPE CANAVERAL AS

The following sections discuss the affected environment or baseline conditions at Cape Canaveral AS. This discussion includes the locations proposed for use by the LTF program as well as adjacent areas that have the potential to be impacted by program activities.

3.1.1 CAPE CANAVERAL AS AIR QUALITY

Air quality in a given area is a function of the area's topography, meteorology, and pollution release characteristics (specific pollutant and the rate, frequency, and location of each release or series of releases). Air quality is described in terms of the concentrations of various pollutants in a given area of the atmosphere. This is generally expressed as parts per million (ppm), milligrams per cubic meter, or micrograms per cubic meter. The lower the overall concentration of a specific pollutant (whether from natural or manmade sources), the better the air quality in that area. The significance of a pollutant concentration is determined by comparison to Federal, state, and/or local air quality standards (see appendix C). The ROI for air quality is the geographic airshed in which the Proposed Action would take place.

3.1.1.1 Meteorology

The climate at Cape Canaveral AS is characterized by long, relatively hot summers and mild winters. The average temperature is 22° Celsius (C) (71° Fahrenheit [F]) with a minimum monthly average of 15°C (60°F) in January and a maximum of 27°C (81°F) in July. During the summer months, relative humidity ranges from 70 to 90 percent. Winter humidity levels are lower, ranging from 55 to 65 percent. Fog is generally a winter phenomenon limited to an average of 54 days annually. It is often associated with the passage of a weather front. (U.S. Air Force, 1996)

During the winter, the prevailing winds are most often from the north and west. The winds generally shift to a southerly origin in the spring and originate predominantly from the south and east in the summer and fall. Midday mixing heights range from an average low of 700 meters (2,300 feet) in the winter to an average high of 1,400 meters (4,600 feet) in the summer. Strong temperature inversions are rare occurrences in this coastal location due to land-sea breeze phenomena and jet stream activity. On average, hurricane-force winds reach Brevard County approximately once in 20 years. (U.S. Air Force, 1996)

Rainfall is seasonal with a wet season occurring from May to October and the remainder of the year being relatively dry. Average annual rainfall for Cape Canaveral AS is approximately 120 centimeters (48 inches), approximately 70 percent of which occurs during the wet season. The Cape Canaveral AS area has the highest average annual number of thunderstorms in the United States. On average, thunderstorms occur 76 days per year at Cape Canaveral AS. During thunderstorms, wind gusts in excess of 96 kilometers per hour (60 miles per hour) and rainfall greater than 2.5 centimeters (1.0 inch) per hour are not uncommon. (U.S. Air Force, 1996)

3.1.1.2 Regional Air Quality

Brevard County and neighboring counties are all classified as being in attainment for the National Ambient Air Quality Standards (NAAQS) and state ambient air quality standards (AAQS). All areas within the ROI are classified as Prevention of Significant Deterioration (PSD) Class II.

3.1.1.3 Air Emissions Sources

The Cape Canaveral AS Title V Air Permit regulates the operation of stationary sources of air pollution emissions at Cape Canaveral AS. Potential sources of air pollution on Cape Canaveral AS include rocket preparation, assembly, and fueling activities; mobile sources such as support equipment, commercial transport (including aircraft), personal vehicles, and launch emissions; and point sources such as heating units, power plants, generators, incinerators, and storage tanks. Nearby air pollution sources include two regional power plants located within 19.3 kilometers (12 miles) of the station.

Exhaust from rocket motor ignition during launches is episodic in nature and does not directly contribute to the long-term air quality at Cape Canaveral AS.

3.1.2 CAPE CANAVERAL AS AIRSPACE

Airspace, or that space that lies above a nation and comes under its jurisdiction, is finite, having dimensions of height, depth, width, and scheduled time. Scheduled time is an essential element of airspace management and air traffic control. Under Public Law 85-726, the FAA is charged with the safe and efficient use of U.S. airspace in accordance with established criteria and limits. This service is provided through the National Airspace System. This system is "...a common network of U.S. airspace; air navigation facilities, equipment and services, airports or landing areas; aeronautical charts, information and services; rules, regulations and procedures, technical information and manpower and material."

Airspace is being considered based on FAA regulation 7400.2C CHG 4 (Federal Aviation Administration, 1992) Part 2, "Objects Affecting Navigable Airspace." Objects that exceed 61 meters (200 feet) above ground level (AGL) require a "Notice of Proposed Construction or Alteration" (FAA Form 7460-1) be submitted to the FAA. The FAA would then perform an obstruction evaluation, and an acknowledgement and/or determination would be issued. Because some of the proposed facilities at the PTC Complex and the I&T Complex are 61 meters (200 feet) AGL, an informal obstruction evaluation will be considered for each alternative location.

Affected Environment at Cape Canaveral AS

The affected environment is defined by the obstruction standards listed on the Obstruction Evaluation Worksheet (FAA Form 7460-6). This worksheet identifies criteria to determine if a structure would be an obstruction to navigable airspace. The first set of criteria is used to determine if a structure exceeds the notice criteria requiring a notice to be filed:

- Structure more than 61 meters (200 feet) AGL
- Structure exceeds a slope from an airport—100 to 1 for a distance of 6.1 kilometers (3.8 miles) from a runway of more than 975 meters (3,200 feet) in length

The second set of criteria is used to determine if the structure exceeds the obstruction standards. The potentially applicable criteria for Cape Canaveral AS are Part V subparts 77.28(a) and (b), "Application of Airport Imaginary Surfaces, Military Airport and Runway Surfaces." A three-dimensional surface will be generated to determine if any LTF facilities are an obstruction to a military airport.

The nearest airport is the Cape Canaveral AS Skid Strip, located approximately 3.1 kilometers (1.9 miles) south of the proposed I&T Complex and 3.4 kilometers (2.1 miles) southwest of the proposed PTC Complex. The Skid Strip, elevation 3 meters (10 feet) above mean sea level (msl), will be the origin for the military airfield imaginary surface. There are two existing obstructions identified on Cape Canaveral AS. One is just north of the I&T Complex and is 156 meters (513 feet) AGL. The second is located at the southern end of Cape Canaveral AS and is 85 meters (280 feet) AGL. (National Ocean Service, 1999a)

The airspace above Cape Canaveral AS is Class D airspace and restricted airspace R-2932. The Class D airspace has a ceiling of 762 meters (2,500 feet). The restricted airspace includes R-2932, managed by the Miami Air Route Traffic Control Center. Altitude is from surface to, but not including, 1,524 meters (5,000 feet). Time of use for R-2932 is continuous. R-2932 is included in the KSC Federal Aviation Regulation 91.143 Space Operations Area that operates on an intermittent basis by Notice to Airmen (NOTAM). Altitude for the Space Operations Area is surface to unlimited. (National Ocean Service, 1999a)

3.1.3 CAPE CANAVERAL AS BIOLOGICAL RESOURCES

The ROI for biological resources includes the native and introduced plants and animals within the area potentially affected by construction activities and operations (figure 2-7). For discussion purposes, these are divided into vegetation, wildlife (including aquatic species), threatened or endangered species, and sensitive habitats. For this analysis, scientific names are only provided the first time that threatened and endangered species are mentioned in the text.

The vegetation and wildlife subsections focus on those species expected to occur in habitats on the project area sites, and birds and mammals of any offshore waters that could potentially be affected by proposed activities. Sensitive species (that is, state species of special concern, and regionally rare and declining species) are included in this discussion. Federally and state-listed threatened and endangered species are discussed under a separate subsection.

Sensitive habitats include wetlands, plant communities that are unusual or of limited distribution, and important seasonal use areas for wildlife (for example, migration routes, breeding areas, crucial summer/winter habitats). Sensitive habitats also include critical habitat as protected by the Endangered Species Act and sensitive ecological areas as designated by state or Federal rulings.

3.1.3.1 Vegetation

Cape Canaveral AS has a series of ridges and swales located parallel to the coastline that support several ecologically important natural communities that are highly fragmented by mission-related construction and clearings. At least 10 high-quality natural communities exist on Cape Canaveral AS. Vegetation consists mainly of indigenous Florida coastal scrub that includes oak and rosemary scrub, and xeric (extremely dry) and maritime hammocks. Coastal strand, coastal dune, and grasslands occur along the 21 kilometers (13 miles) of Atlantic Ocean shoreline. Seagrasses are located in the nearby rivers. Wetlands will be discussed under Environmentally Sensitive Habitats. The remaining areas are associated with the cleared launch complexes and support facilities. (U.S. Air Force, 1997)

Oak scrub consists of densely growing shrubs such as myrtle oak, sand live oak, saw palmetto, and Chapman oak and is the predominant vegetation on the areas proposed for the LTF program (table 3.1.3-1). Before modern development, these oak scrub communities would have burned frequently from lightning-set fires. However, fire suppression has caused the scrub to become so densely vegetated that burning could result in a catastrophic fire completely removing vegetation from the area. Cape Canaveral AS has a burn plan to manage oak scrub. (U.S. Air Force, 1997)

Table 3.1.3-1: Cape Canaveral AS Alternative Wetlands and Land Cover

Category	Area in hectares (acres)
Proposed PTC Complex/Laydown Area Wetlands	
None/None	0 (0)/0 (0)
Total Wetlands	**0 (0)/0 (0)**
Proposed I&T Complex Wetlands	
None	0 (0)
Total Wetlands	**0 (0)**
Proposed PTC Complex/Laydown Area Land Cover	
Oak Scrub/Scrubby Flatwoods	0.02 (0.05)/3.31 (8.17)
Disturbed Shrubs/Exotics	0.00 (0.00)/0.19 (0.48)
Urban/Developed	6.08 (15.04)/0.56 (1.38)
Total Area	**6.10 (15.09)/4.06 (10.03)**
Proposed I&T Complex Land Cover	
Disturbed Shrubs	4.52 (11.17)
Oak Scrub/Scrubby Flatwoods	5.61 (13.87)
Urban/Developed	0.12 (0.31)
Total Area	**10.25 (25.35)**

Xeric hammock is prevalent in the southern half of the station between the industrial area and the launch complexes. The xeric hammock is dominated by live oak and saw palmetto. Scrub oaks are seldom present, distinguishing xeric hammock from oak scrub; red bay and twinberry are rarely present, distinguishing xeric hammock from maritime hammock. (U.S. Air Force, 1997)

Maritime hammock is found on Cape Canaveral AS in two locations: Atlantic maritime hammock on the east side, just landward of coastal strand, and Banana River maritime hammock on the west side of the peninsula, bordering the Banana River. The largest stand of Atlantic maritime hammock occurs on the southern end of the station. Red bay and live oak canopies often have a subcanopy of twinberry, Hercules' club, buckthorn, and cabbage palm. Saw palmetto is dominant in the understory, with vines such as muscadine grape, catbrier, Virginia creeper, and poison ivy a prominent feature. The ground surface has a thick layer of leaf litter that limits the growth of small herbs. The Banana River maritime hammock is classified as shell mound in the Florida Natural Areas Inventory classification system. Cabbage palm, Carolina laurelcherry, and red mulberry occur in the canopy as well as red bay and live oak. Shell mound species include red cedar and hackberry. Fern species are abundant in this maritime hammock. (U.S. Air Force, 1997)

Coastal strand typically contains dense thickets of woody shrubs such as cabbage palm, saw palmetto, sea grapes, and tough buckthorn. Some of this habitat has been disturbed by previous construction of launch complexes, but can reestablish itself in a relatively short period of time. Portions of LC-15 are within 61 meters (200 feet) of the beach area and could be within the influence of the coastal strand communities. (U.S. Air Force, 1997)

Coastal dunes contain sea oats (a State Species of Special Concern) and are inhospitable to many plants because of the constantly shifting substrate, salt deposition, abrasion from wind-blown sand, and effects of storm waves. The beaches north of Cape Canaveral AS have been eroding, while beaches to the south are increasing. Cape Canaveral AS is also increasing, and supports several parallel dune lines and conspicuous offshore sandbars. Sea oats, beach elder, railroad vine, beach croton, bitter panic grass, saltgrass, camphorweed, and beach cordgrass can often be found in coastal dune communities. Florida Statute 370.41 prohibits the disturbance or removal of sea oats (Cape Canaveral Air Station 45th Space Wing, 1996). (U.S. Air Force, 1997)

Grasslands often are landward from coastal dune communities, in areas that are of newly deposited sand, or receive frequent disturbances that keep out the woody species. Grasslands are densely vegetated with grasses and other herbaceous species, although woody species such as varnish leaf, wax myrtle, and saw palmetto are scattered throughout. Muhly grass, sea oats, beach cordgrass, camphorweed, prickly pear, beach croton, and other coastal dunes species can also be found. Cape Canaveral is one of the few broad barrier islands on the East Coast. Grasses uniquely dominate its backdune zone. (Myers and Ewell, 1992)

Seagrasses are present in the northern Indian River system (including the Banana River) and include Cuban shoal, manatee, and turtle grasses.

3.1.3.2 Wildlife

The coastal scrub and associated woodlands provide habitat for mammals including the white-tailed deer, armadillo, bobcat, feral hog, and raccoon.

Numerous land and shore birds are found within the ROI at Cape Canaveral AS. Maritime hammock provides habitat for the little blue heron, mourning dove, scrub jay, gray catbird, black-throated warbler, and northern cardinal. Burned hammock provides habitat for the rufous-sided towhee, common yellow-throat, northern mockingbird, house wren, downy woodpecker, and osprey. Oak-hickory scrub is habitat for the blue and scrub jays, doves, and red-bellied woodpecker, as well as many maritime hammock species. Shore birds include the black-necked stilt, willet, ruddy turnstone, spotted sandpiper, gulls, Caspian tern, brown pelican, roseate spoonbill, wood stork, and great blue heron. Turkey vultures, hawks, barn swallow, fish crow, common grackel, warblers, and sparrows are also located on Cape Canaveral AS. (U.S. Air Force, 1997)

Neotropical migrants observed on Cape Canaveral AS include warblers, such as the blue-winged and black-and-white warblers, yellow-throated and red-eyed vireos, eastern kingbird, ovenbird, American redstart, merlin, cooper's hawk, and peregrine falcon. These species mainly use the maritime hammock. (U.S. Air Force, 1997)

Numerous amphibians, reptiles, and fish have been observed at Cape Canaveral AS. Amphibians observed include the spade-foot and eastern narrow-mouth toads, squirrel and southern leopard frogs, and green treefrogs. Reptiles observed include the American alligator, Florida box turtle, gopher tortoise, Florida softshell, green anole, six-lined racerunner, broadhead skink, southern ringneck snake, everglades racer, eastern coachwhip, and mangrove salt marsh snake. Bluegill, garfish, largemouth bass, killifishes, sailfin molly, and topminnow can be found in the small freshwater habitats on Cape Canaveral AS. (U.S. Air Force, 1997)

Marine mammals, including the bottlenose dolphin, spotted dolphin, and manatee, can be found along the coast of Florida. The seagrass beds in the northern Indian River system provide important nursery areas, shelter, and foraging habitat for a wide variety of fishes, invertebrates, manatees, and other aquatic organisms. The Banana and Indian rivers, and Mosquito Lagoon, provide habitat for marine worms, mollusks, and crustaceans.

3.1.3.3 Threatened and Endangered Species

The U.S. Fish and Wildlife Service (USFWS) lists species that are endangered or threatened and those that are proposed for endangered or threatened status. An endangered species is defined as any species in danger of extinction throughout all or a

significant portion of its range. A threatened species is one that is likely to become endangered in the foreseeable future. Cape Canaveral AS contains habitat utilized by a large number of Federally and state-listed species. Those listed species that are known to occur within or near its boundaries are listed in table 3.1.3-2.

No Federally listed plant species have been identified on Cape Canaveral AS. Six species of state-listed plants (table 3.1.3-2) were documented on Cape Canaveral AS by the Florida Natural Areas Inventory. Additional species may be located at LC-15, but this area has not been surveyed (Patrick Air Force Base, 1999). (U.S. Air Force, 1997)

Listed animals in the vicinity of the launch complexes include the bald eagle (*Haliaeetus leucocephalus*), an occasional visitor, and American alligator (*Alligator mississippiensis*). Atlantic loggerhead (*Caretta caretta*), leatherback (*Dermochelys coriaacea*), and green sea (*Chelonia mydas*) turtles are located along the Atlantic coastline. The southeastern beach mouse (*Peromyscus polionotus niveiventris*) occurs along the vegetation zones paralleling the beach and dune lines. The eastern indigo snake (*Drymarchon corais couperi*) occurs in moist areas or in dry land gopher tortoise burrows. Gopher tortoises are found in all habitats. The Florida scrub jay (*Aphelocoma coerulescens*) is found in Florida coastal scrub and slash pine stands, and the West Indian manatee (*Trichechus manatus*) is found along the Banana River and occasionally observed in the ocean (Patrick Air Force Base, 1999). (U.S. Air Force, 1997)

The gopher tortoise is still common in some parts of its range, although rare in others. Although this species is not formally listed by the Federal or state government, gopher tortoise burrows provide important habitat to numerous other protected species. This valuable habitat warrants special note in this subsection. It was found in moderate densities on Cape Canaveral AS, in areas of sandy, well-drained soils, primarily in coastal strand and dry clearings. It prefers open habitats that have herbaceous plants for forage including disturbed areas such as recent burn areas, road shoulders, fence lines, and launch complexes. Gopher tortoises are tolerant of human presence. (U.S. Air Force, 1997)

American alligators live in fresh to brackish waters found in marshes, ponds, lakes, rivers, swamps, bayous, and large spring runs. They bask on land next to the water and dig dens and build nests in riverbanks, lake margins, or marshes. They use the dens to escape from cold or drought.

The threatened eastern indigo snake has been identified on Cape Canaveral AS and probably occurs throughout the station. It occurs in most types of hammocks, often near wetlands, and is often associated with gopher tortoise burrows. (U.S. Air Force, 1997)

Table 3.1.3-2: Threatened and Endangered Species Occurring or Potentially Occurring at Cape Canaveral AS, Florida

Scientific Name	Common Name	State Status	Federal Status
Plants			
Asclepias curtissii	Curtiss' milkweed	E	—
Chrysophyllum oliviforme	Satin-leaf	E	—
Glandulareia maritima	Coastal vervain	E	—
Lechea cernua	Nodding pinweed	E	—
Ophioglossum palmatum	Hand fern	E	—
Remirea maritima	Beach-star	E	—
Reptiles and Amphibians			
Alligator mississippiensis	American alligator	SC	T(S/A)
Caretta caretta	Loggerhead sea turtle	T	T
Chelonia mydas	Green sea turtle	E	T
Dermochelys coriacea	Leatherback sea turtle	E	E
Drymarchon corais couperi	Eastern indigo snake	T	T
Eretmochelys imbricata	Hawksbill sea turtle	E	E
Lepidochelys kempi	Atlantic (Kemp's) Ridley sea turtle	E	E
Birds			
Aphelocoma coerulescens	Florida scrub jay	T	T
Charadrius melodus	Piping plover	T	T
Falco peregrinus[1]	Peregrine falcon	E	—
Haliaeetus leucocephalus	Bald eagle	T	T
Mycteria americana	Wood stork	E	E
Mammals			
Balaenoptera borealis	Sei whale	E	E
Balaenoptera physalus	Finback whale	E	E
Eubalaena glacialis	Northern right whale	E	E
Megaptera novaeangliae	Humpback whale	E	E
Peromyscus polionotus niveiventris	Southeastern beach mouse	T	T
Physeter macrocephalus	Sperm whale	E	E
Trichechus manatus	Manatee	E	E

Source: U.S. Air Force, 1997; Cape Canaveral Air Station 45th Space Wing, 1996; U.S. Department of the Interior, 1998.

(1) Recently delisted, but will be monitored for the next decade
E Endangered
SC Special concern (state designation)
(S/A) Listed by similarity of appearance to a listed species
T Threatened

Green sea turtle breeding populations along the Florida and Pacific coasts and Mexico are Federally listed as endangered. Pollution and development are degrading the nesting and feeding habitats for the green sea turtle. Nighttime lighting near beaches makes nesting beaches unsuitable for successful reproduction. The Air Force has adopted strict light management policies to minimize the impact of artificial lighting on sea turtle hatchlings and adults (Cape Canaveral Air Station 45th Space Wing, 1996). Development on the beaches sometimes forces nesting to occur too close to the tidal zone, and tidal inundation and erosion destroy many nests. Green sea turtles are present on the Florida

coast from May to September and are known to nest on Cape Canaveral AS beaches. (U.S. Air Force, 1997)

The loggerhead sea turtle is relatively abundant and occupies most of the Florida coastline. When nesting, they are present on the beaches of Florida from May to September. It is possible that only the females are migratory; others are known to occupy Florida waters year-round. They are known to nest on Cape Canaveral AS beaches. The leatherback sea turtle (*Dermochelys coriacea*) population in Florida is small and threatened by development causing lighting problems, erosion, nest predation by animals and humans, and pollution along the beaches. They mainly occur in the open sea, but a few females can be found on the Florida beaches and coastal waters from April to July. The leatherback sea turtle has been reported to nest on Cape Canaveral AS beaches (thirteen occasions) (Patrick Air Force Base, 1999). Although the Atlantic (Kemp's) Ridley (*Lepidochelys kempi*) and the hawksbill sea turtles (*Eretmochelys imbricata*) are not known to nest on Cape Canaveral AS beaches, they have been known to occur in the waters off the Florida coast and near shore areas. (U.S. Air Force, 1997)

Wood storks (*Mycteria americana*) forage in marshes, ponds, and lagoons, and are year-round residents in the Cape Canaveral AS area. The wood stork is a specialized Federal and state endangered wading bird that catches fish by groping in water 15 to 25 centimeters (6 to 10 inches) deep and snapping up prey that touch its bill. Wood storks are more susceptible to water level fluctuations than other wading birds. Wood storks are colonial wading birds that rarely breed before 4 years of age. They nest in the treetops of mangrove swamps or by man-made impoundments. (Kennedy Space Center, 1997;1999; U.S. Air Force, 1997)

The bald eagle was down-listed to threatened throughout the conterminous United States in 1995, although the Florida population has been listed as threatened for years. They can be found year-round near the coast, rivers, and large lakes of Florida, but do not breed on Cape Canaveral AS, although numerous active nests have been reported at KSC, approximately 10 kilometers (6 miles) west of LC-15 (See section 3.2.3.3). Bald eagles can be tolerant of human activity if the activity is not directed toward them. (U.S. Air Force, 1997; National Aeronautics and Space Administration, 1997a)

All free-flying peregrine falcons (*Falco peregrinus*) were Federally listed as endangered, because of the similarity of appearance to the Eurasian subspecies *F. p. peregrinus,* which is listed as endangered. The subspecies *F. p. anatum* was removed from Federal listing in October 1994 as a recovered subspecies. The American peregrine falcon, which was recently delisted, migrates through the Florida area and can be found most of the year, except from mid-June to mid-August. The bird is basically tolerant of human presence. (U.S. Air Force, 1997)

The Florida scrub jay is a year-round resident that is very sedentary and territorial. Its habitat is in open oak scrub without a dense canopy, as well as palmetto, sand pine, and rosemary. Successful scrub jay nesting has occurred between Samuel C. Phillips Parkway along the coast and LC-41. Drier, more sparsely vegetated habitats are better for scrub

jay management activities than wetter areas that are valuable for other species. The species can become habituated to human presence over time. Piping plovers (*Charadrius melodus*) nest in or near least tern colonies along the Atlantic coast from approximately March to August. They may also overwinter in the area. (U.S. Air Force, 1997)

The Florida manatee is endemic in this region of Florida. They occupy shallow coastal waters, estuaries, bays, and enter coastal rivers and lakes. Sheltered bays, coves, and canals are important for reproductive activities. Manatees are semipermanent residents in the area, but may migrate southward for the winter. Manatee critical habitat is present on Cape Canaveral AS and in the surrounding area. Manatees are sensitive to human disturbance, which can result in low population densities, low reproductive rates, limited range, and high mortalities. Die-offs associated with red tides and unusually cold weather have occurred in Florida; however, the primary threat to the manatee is injury inflicted by motor boats. (U.S. Air Force, 1997)

Southeastern beach mouse populations on Cape Canaveral AS have been found at the launch complexes where the area is artificially open grassland. The coastal grasslands and strand communities provide the highest population densities at Cape Canaveral AS. Other habitat is the primary dune, although the sea oat vegetation is not as optimal for the beach mouse as the grassland. (U.S. Air Force, 1997)

Finback (*Balaenoptera physalus*), humpback (*Megaptera novaeangliae*), northern right (*Eubalaena glacialis*), sei (*Balaenoptera borealis*), and sperm (*Physeter macrocephalus*) whales are pelagic mammals that are generally found from the shelf edge seaward. Large baleen whales tend to move to northern temperate waters in the spring and toward the equator in the fall. Their migration takes them past Cape Canaveral AS and around the tip of Florida north of Cuba. (U.S. Air Force, 1997)

3.1.3.4 Sensitive Habitats

Environmentally sensitive habitats on Cape Canaveral AS include wetlands, rookeries, and listed species critical habitats.

Wetlands

Wetlands are defined by the USACE as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

Cape Canaveral AS contains many wetlands and associated vegetation communities including estuarine tidal (mangrove) swamps and marshes, hydric hammock, coastal interdunal swales, and man-made borrow pits and canals. A U.S. Fish and Wildlife National Wetlands Inventory conducted in 1994 identified a total of 905 hectares (2,235 acres) of wetlands on Cape Canaveral AS. As shown in table 3.1.3-1, no

wetlands are located within the areas proposed for use as part of the LTF program (National Wetlands Inventory, 1999). (U.S. Air Force, 1997)

Bird Rookeries

The nearest rookery is located west of LC-15 on the Banana River Spoil Islands (National Aeronautics and Space Administration, 1997a).

Critical Habitat

Manatee critical habitat is located in the Banana River system. It includes the entire inland section of the Indian River, the entire inland section of the Banana River, and all waterways between the Indian and Banana rivers, with the exception of some man-made structures or impoundments not necessary to the normal needs of the manatee. The National Marine Fisheries Service (NMFS) has designated the water adjacent to the coast of Florida as critical habitat for the northern right whale. (National Aeronautics and Space Administration, 1997a)

3.1.4 CAPE CANAVERAL AS CULTURAL RESOURCES

Cultural resources include prehistoric and historic sites, structures, districts, artifacts, or any other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious, or any other reason. For ease of discussion, cultural resources have been divided into archaeological resources (prehistoric and historic), historic buildings and structures, and native populations/ traditional resources (for example, Native American sacred or ceremonial sites).

Numerous laws and regulations require that possible effects to cultural resources be considered during the planning and execution of Federal undertakings. These laws and regulations stipulate a process of compliance, define the responsibilities of the Federal agency proposing the action, and prescribe the relationship among other involved agencies (for example, the State Historic Preservation Officer [SHPO], the Advisory Council on Historic Preservation). In addition to the NEPA, the primary laws that pertain to the treatment of cultural resources during environmental analysis are the National Historic Preservation Act (especially Sections 106 and 110), the Archaeological Resources Protection Act, the American Indian Religious Freedom Act, and the Native American Graves Protection and Repatriation Act (NAGPRA).

Only those cultural resources determined to be potentially significant under cultural resources legislation are subject to protection from adverse impacts resulting from an undertaking. To be considered significant, a cultural resource must meet one or more of the criteria established by the National Park Service that would make that resource eligible for inclusion in the National Register of Historic Places (National Register). The term "eligible for inclusion in the National Register" includes all properties that meet the National Register-listing criteria specified in Department of Interior regulations 36 CFR 60.4. Therefore, sites not yet formally evaluated may be considered potentially eligible to

the National Register and, as such, are afforded the same regulatory consideration as nominated properties. Whether prehistoric, historic, or traditional, significant cultural resources are referred to as historic properties.

The ROI for cultural resources at Cape Canaveral AS, as well as for all other alternative locations, encompasses all areas of ground disturbance and all buildings and structures subject to modification as a result of LTF program activities. For the purposes of this analysis, the term ROI is synonymous with the area of potential effect as defined under cultural resources legislation.

3.1.4.1 Prehistoric and Historic Archaeological Resources

Archaeological investigations at Cape Canaveral AS indicate that human occupation of the area first occurred approximately 4,000 years ago. Early settlement was focused within the Banana River salt marsh environment; however, over time, site distribution and size fluctuated, and there is archaeological evidence that the entire peninsula was exploited for a wide variety of marine, estuarine, and terrestrial resources. Occupation of the area is divided into seven periods: the Archaic Period; the Orange Period; the Transitional Period; the Malabar I, IIA, and IIB Periods; and the Protohistoric or Seminole Period.

Numerous archaeological surveys have been conducted at Cape Canaveral AS (University of West Florida, 1990; U.S. Army Corps of Engineers and 45th Space Wing, 1994; Le Baron, 1884; National Park Service, 1984; Kennedy Space Center, 1967; Moore, 1922; Rouse, 1951; Stirling, 1935; U.S. Army Corps of Engineers, 1988a, 1989, 1990, 1991; Wiley, 1954). In addition, in 1992, the USACE synthesized data from several of these studies and developed a cultural resources sensitivity map for Cape Canaveral AS (New South Associates, 1996). Fifty-six prehistoric and historic archaeological sites have been recorded; 19 of these sites have been recommended as eligible for listing in the National Register. None of the identified sites are located within the LTF ROI (New South Associates, 1996).

3.1.4.2 Historic Buildings and Structures

In 1949, the Cape Canaveral AS Long-Range Proving Ground was formally established under the direction of the Air Force. Construction of the first missile launch pads, support facilities, and down-range tracking stations began in 1950, and throughout that decade, military facilities and activities developed at a rapid pace. Various cruise-type missiles were tested during these years, and the installation began to support the Intermediate Range and Intercontinental Ballistic Missile programs, as well as manned flight space exploration. Activity at the installation peaked in 1966 with more than 30 operational launch complexes having been constructed; however, over the next 10 years, programs and operations began to decline. Launch complexes and support buildings that had served their purposes were adapted to other uses, deactivated, or put on standby status. Current Air Force launch programs include ballistic missile operations and commercial launch operations (New South Associates, 1996).

Historic building and structure surveys of the Cape Canaveral AS include those conducted by the National Park Service in association with the Man in Space theme (1980); Resource Analysts, Inc., of Bloomington, Indiana (National Park Service, 1983); and the U.S. Army Construction Engineering Research Laboratories (U.S. Department of the Air Force, 1994; U.S. Air Force, 1994). Of these surveys, 14 National Register-listed or -eligible historic buildings and structures have been identified (New South Associates, 1996). Seven of the fourteen properties (six launch complexes [5/6, 13 MST, 14, 19, 26, 34] and the original Mission Control Building) compose a National Historic Landmark district associated with the Man in Space Program. The remaining seven properties are LC-1/2, -3/4, -17, -21/22, -25, -31/32, and the Cape Canaveral Lighthouse, all of which are considered eligible for inclusion in the National Register.

None of the National Register-eligible or -listed properties are within the direct disturbance ROI for LTF; however, LC-14 is situated within the 549-meter (1,800-foot) ESQD. The historic significance of other proposed buildings and structures within the ROI has not been determined (that is, the high bay Building 54445 complex); however, if utilized, no modifications are expected.

3.1.4.3 Native Populations/Traditional Resources

At the time of European contact, the Cape Canaveral AS and Banana River areas were populated by tribal groups of the Ais Indian tribe. Settlements were described by early explorers as sparse and isolated, and historical accounts indicate that they remained so well into the eighteenth century (New South Associates, 1993). The Ais settlements closest to Cape Canaveral AS were the Ulumay villages along the Banana River. These settlements were numerous, changed with the seasons, and reflected a fishing and gathering subsistence; agriculture was not practiced. Dwellings were impermanent, and tools and utensils were typically fashioned of conch shell or gourds.

After European contact, the Ais had easy access to trade items and precious metals from the Spanish and French. Because of their proximity to the Straits of Florida, they also took advantage of the numerous shipwrecks along the Florida coast. Wrecks were looted for their treasure, and survivors were typically taken in as slaves and then later bartered back to the Europeans. By 1760, few Ais remained, their disappearance attributable to European diseases, encroachment of their land, and enslavement. A few are believed to have moved into southern Florida, where they may have banded together with other tribes to ultimately form the Seminole culture. Today, there are no known direct descendants of the Ais Tribe remaining; the Seminole and Miccosukee tribes are recognized as the appropriate Native American cultures for consultation during the treatment of Ais remains.

Significant traditional resources sites are subject to the same regulations and are afforded the same protection as other types of historic properties. Traditional sites associated with the Ais could include archaeological and burial sites, mounds, ceremonial areas, hillocks, water sources, plant habitat or gathering areas, or any other natural area important to this culture for religious or heritage reasons. By their nature, traditional resources sites often overlap with (or are components of) archaeological sites. As such, some of the National

Register-listed or -eligible sites identified at Cape Canaveral AS could also be considered traditional resources sites or contain traditional resources elements. No traditional cultural properties have been identified within the LTF ROI.

3.1.5 CAPE CANAVERAL AS GEOLOGY AND SOILS

This section provides an overview of the physiography, geology, soils, and geologic hazards in the vicinity of Cape Canaveral AS. In general, the ROI is defined by the regional geologic setting and the areas in the immediate vicinity of the proposed PTC Complex and I&T Complex that could be affected by construction and operation activities.

3.1.5.1 Physiography

Cape Canaveral AS lies on a barrier island composed of relict beach ridges formed by wind and wave action. This island is approximately 89 kilometers (55 miles) in length and 7.2 kilometers (4.5 miles) wide. Land surface on the island ranges from sea level to 6 meters (20 feet) above msl at the harbor dredge disposal site near Port Canaveral. The higher elevations occur along the eastern portion of Cape Canaveral AS, with a gentle slope to lower elevations toward the marshlands along the Banana River (U.S. Air Force, December 1997). Land surface at the proposed PTC Complex and I&T Complex sites is relatively flat, with surface elevations averaging approximately 3 meters (10 feet) above msl (National Aeronautics and Space Administration, 1992).

3.1.5.2 Geology

The geology underlying Cape Canaveral AS can be generally defined by four stratigraphic units; youngest to oldest, these units are: the surficial sands, the Caloosahatchee Marl, the Hawthorn Formation, and the limestone formations of the Floridan Aquifer (U.S. Air Force, 1997).

The surficial sands immediately underlying the surface are Pleistocene- to Recent-age (less than 1.6 million years old) sandy marine deposits. These undifferentiated sandy units typically extend to depths of approximately 3 to 9 meters (10 to 30 feet) below the surface.

The Caloosahatchee Marl underlies the surficial sands and consists of fine-grained, semi-confining zones of Pliocene to Upper Miocene age (about 1.6 million to 10 million years old). The Caloosahatchee consists of green to gray sandy shell marl with varying silt, clay, and shell content. This formation generally extends to a depth of approximately 21 meters (70 feet) below the surface.

The Hawthorn Formation underlies the Caloosahatchee Marl and is of Miocene age (about 10 million to 24 million years old). The Hawthorn Formation is the regional confining unit for the Floridan Aquifer, and consists of green to gray clays, silty clays, and sands with phosphatic zones and beds of sandy limestone. This formation is generally 24 to 37

meters (80 to 120 feet) thick, typically extending to a depth of approximately 55 meters (180 feet) below the surface (U.S. Air Force, 1997).

Beneath the Hawthorn Formation lie the Eocene-age (about 37 million to 58 million years old) limestone formations of the Floridan Aquifer. The upper limestone units from the youngest to oldest are Williston, Inglis, Avon Park, and Ocala Formations. The Floridan Aquifer and other limestone formations extend several thousand feet below the surface at Cape Canaveral AS (U.S. Air Force, 1997).

3.1.5.3 Soils

The soil survey of Brevard County identified 11 different soil types within Cape Canaveral AS. The three most prominent soils compose the Canaveral-Palm Beach–Welaka association. These associations are nearly level to gently sloping with moderately well-drained to excessively drained soils and are sandy throughout. The soils are highly permeable with low water retention capability. There are no prime or unique farmland soils on Cape Canaveral AS. (U.S. Air Force, 1997)

3.1.5.4 Geologic Hazards

Unstable Soils

The presence of unstable or plastic geologic materials in the near-surface can create foundation problems in construction projects. Soils containing high levels of organic materials (i.e., peat or mulch deposits) may not have the strength to support developed structures, and some clay soils shrink and swell upon drying or wetting, which can stress building foundations. Structural integrity can also be affected by the soil's susceptibility to wind and water erosion. (Florida Geological Survey, 1994)

Soils within the vicinity of the LTF sites are predominantly sandy throughout and, as such, are well-drained and exhibit low shrink/swell susceptibility. Although these soils exhibit a low susceptibility to sheet and rill erosion by water, they are considered highly susceptible to wind erosion (Iowa State University Statistical Laboratory, 1998). No problems associated with previous construction activities at Cape Canaveral have been identified (U.S. Air Force, 1997).

Sinkholes

The principal geologic hazard in central Florida is sinkholes that develop when overlying soils collapse into existing cavities. Cape Canaveral AS is not located in an active sinkhole area, and the review of topographic maps did not reveal the presence of any sinkholes. The Canaveral Peninsula is not prone to sinkholes, because the limestone formations are over 30 meters (100 feet) below the ground surface, and confining units minimize groundwater recharge to the limestone (U.S. Air Force, 1997).

Seismicity

A seismological investigation conducted by the Seismological Branch of the U.S. Coast and Geodetic Survey showed that the Cape Canaveral underground structure is generally free of anomalies, voids, and faults (National Aeronautics and Space Administration, 1997). Cape Canaveral AS is located in a seismic zone 0, meaning that seismic disturbances are rare and associated risks are considered low (Florida Department of Natural Resources, 1991). There are no known areas of volcanic activity within the State of Florida.

3.1.6 CAPE CANAVERAL AS HAZARDOUS MATERIALS AND HAZARDOUS WASTE MANAGEMENT

Hazardous materials and wastes are those substances defined as hazardous by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 U.S.C. Sections 9601-9675), the Toxic Substances Control Act (15 U.S.C. Sections 2601-2671), and the Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act (RCRA) (42 U.S.C. Sections 6901-6992). In general, this includes substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristics, may present substantial danger to public health or welfare, or to the environment when released into the environment. In addition, hazardous substances and hazardous chemicals are regulated by the Emergency Planning and Community Right to Know Act (42 U.S.C. Sections 11001-11050). Transportation of hazardous materials is regulated by the U.S. DOT regulations within 49 CFR.

The following subsections discuss hazardous materials, hazardous waste, pollution prevention, remediation sites, storage tanks, asbestos, polychlorinated biphenyls (PCBs), and lead-based paint. The ROI for hazardous materials and hazardous waste management encompasses all geographic areas that are exposed to the possibility of a release of hazardous materials or hazardous wastes or that may be affected by an IRP site. The ROI includes the areas around the proposed LTF facilities as well as those areas where hazardous materials or wastes related to LTF construction or operation are transported, stored, generated, or disposed and where construction activities are necessary on contaminated sites.

3.1.6.1 Hazardous Materials Management

Numerous types of hazardous materials are used annually to support the various missions and general maintenance operations at Cape Canaveral AS. These materials range from volatile organic compounds and non-volatile organic compound primers, paints, industrial solvents, and cleaners to hazardous fuels. Hazardous materials are also used by on-station contractors supporting station construction and operations.

Although hazardous materials management is the responsibility of each individual or organization, there is a central reporting requirement for all hazardous materials that come on the base. All hazardous material brought on the installation (operation or construction) must be reported to the HAZMART at Patrick Air Force Base (AFB), tracked through the

Air Force Environmental Management Information System (AF-EMIS) and otherwise managed in accordance with Air Force Instruction 32-7086, Hazardous Material Management. The operator and construction contractor will report all chemicals, locations, etc. as required by SARA Title III (Emergency Planning and Community Right-To-Know Act, EPCRA) to 45 CES/CEV at Patrick AFB on a quarterly report, as well as tracking them in the AF-EMIS tracking system.

All hazardous materials must be summed up into one figure by base personnel to meet Federal reporting requirements regarding threshold quantities of waste. A separate materials pharmacy system for procurement, storage, and distribution of hazardous materials has not yet been established at Cape Canaveral AS. Individual contractors at Cape Canaveral AS may obtain hazardous materials through their own organizations, local purchases, or other outside channels, although contractors are required to enroll in the HAZMART Pharmacy at Patrick AFB and encouraged to obtain hazardous materials through the pharmacy whenever possible.

Hazardous fuels are controlled by the Joint Propellants Contractor (JPC) for the 45th Space Wing (45 SW). The JPC provides for the purchase, transport, temporary storage, and loading of hazardous fuels and oxidizers. Because of the limited storage capacity on station, only limited quantities of hypergolic fuels are stored onsite at any time. Spills of hazardous materials are covered under 45 SW Operational Plan 32-3, *Hazardous Materials Response Plan*. Cape Canaveral AS has a hazardous materials response team.

3.1.6.2 Hazardous Waste Management

Hazardous waste management at Cape Canaveral AS is regulated under 40 CFR 260-280 and Florida Administrative Code (FAC) 62-730. These regulations are implemented through 45 SW Operational Plan 19-14, *Petroleum Products and Hazardous Waste Management Plan*.

The Air Force, as the owner of the facilities at Cape Canaveral AS, is considered the generator of a majority of the hazardous wastes. There are some commercial operations that manage waste under the contractor's own U.S. Environmental Protection Agency (U.S. EPA) identification number. All hazardous waste generated is labeled with the U.S. EPA identification number for Cape Canaveral AS and is transported, treated, and disposed of under this number. All individuals or organizations at Cape Canaveral AS are responsible for administering all applicable regulations and plans regarding hazardous waste, and for complying with applicable regulations regarding the temporary accumulation of waste at the process site. The JPC collects and transports hazardous waste (including propellant waste) from the process site to a 90-day hazardous waste accumulation area, to the permitted 1-year hazardous waste storage facility, or to a licensed disposal facility off station. Hazardous items that cannot be managed by the Defense Reutilization and Marketing Office (DRMO) are disposed of as hazardous waste. (U.S. Air Force, 1998)

The Environmental Support Contractor (ESC) provides environmental management and technical support for Cape Canaveral AS. The ESC ensures that contractors have

hazardous waste management programs in place, offers hazardous waste training, and reviews and inspects contractors to verify compliance with the 45 SW Operational Plan 19-14 and all applicable regulations. The ESC also operates the permitted hazardous waste storage facility on Cape Canaveral AS. The 45th Civil Engineer Squadron/Environmental Flight at Patrick AFB is the environmental support organization that provides oversight of the ESC at Cape Canaveral AS. (U.S. Air Force, 1998)

The DRMO is responsible for managing and marketing excess and recoverable products and waste materials in accordance with applicable regulations. Hazardous items that cannot be marketed by the DRMO are disposed of as hazardous wastes. The DRMO is also responsible for obtaining offsite hazardous and non-hazardous disposal contracts at all downrange sites. Cape Canaveral AS rarely uses DRMO, as they have their own contracts and hazardous waste disposal procedures.

Cape Canaveral AS currently operates a single main hazardous waste storage facility at buildings 44200/44205 that is permitted (RCRA Part B Permit, Number HO01-255040) to store hazardous wastes for up to 1 year. The site is permitted under the current Florida Department of Environmental Protection (FDEP) permit, and is operated by the ESC. This facility was constructed to replace buildings 44632, 54810, and 55123 that were previously used to store hazardous waste and are now closed. The new waste storage site is not permitted to store hydrazine, monomethyl hydrazine, or nitrogen tetroxide hazardous wastes. These wastes are stored at Fuel Storage Area 1 for less than 90 days and are taken off station for disposal. Cape Canaveral AS currently operates one hazardous waste treatment facility (Building 15305), the Explosive Ordnance Disposal Facility, which provides thermal treatment of waste explosive ordnance. The Explosive Ordnance Disposal Facility operates under the current FDEP permit and the associated Subpart X permit application.

Individual contractors and organizations maintain hazardous waste satellite accumulation points and 90-day hazardous waste accumulation areas in accordance with 45 SW Operational Plan 19-14. Cape Canaveral AS operates approximately 65 satellite accumulation points. A maximum of 208 liters (55 gallons) per waste stream of hazardous waste can be accumulated at a satellite accumulation point. There are currently approximately seventeen 90-day accumulation areas on station. The number of accumulation points changes quarterly as do operations. There is no limit to the volume of waste that can be stored, but wastes must be taken to the permitted 1-year facility or disposed of offsite within 90 days. Cape Canaveral AS reported the generation of 274 metric tons (302 tons) of hazardous waste in 1995. Spent caustic and other liquid wastes make up the majority of Cape Canaveral AS hazardous waste generation. (Albury, 1998)

3.1.6.3 Pollution Prevention

Air Force Policy Directive 32-70, *Environmental Quality*, outlines the Air Force policy for pollution prevention. This directive references Air Force Instruction 32-7080, *Pollution*

Prevention Program, which defines the Air Force's Pollution Prevention Program requirements.

A Pollution Prevention Management Plan has been prepared for Cape Canaveral AS. The Pollution Prevention Management Plan establishes the overall strategy, delineates responsibilities, and sets forth specific objectives for reducing pollution of the ground, air, surface water, and groundwater. The operator/constructor will recycle and follow affirmative procurement requirements as stated in Executive Orders (EOs) 12856 and 13101. All recycling and affirmative procurement will be reported to 45 CES/CEV at Patrick AFB in a monthly report.

3.1.6.4 Remediation

The IRP is a program to identify, characterize, and remediate past environmental contamination on DOD installations. The program has established a process to evaluate past disposal sites, control the migration of contaminants, and control potential hazards to human health and the environment.

To date, 103 IRP sites have been identified at Cape Canaveral AS. Of these, 25 sites are currently in the site investigation stage, 45 are in the remedial investigation/feasibility study (RI/FS), Temporary Remedial Measures, or Petroleum Contamination Assessment stages, 24 are proposed for No Further Remedial Action Planned or monitoring only, and 9 have regulatory closure (U.S. Air Force, 1998). In addition, numerous Air Force Areas of Concern have been identified during various preliminary assessments conducted at the station since 1984.

The identification of areas contaminated by petroleum is separate from that for IRP sites. This is a specific requirement under the FDEP's Petroleum Contamination Assessment (FAC 62-770 protocols). To date, 28 petroleum-contaminated sites have been identified at Cape Canaveral AS. Of these, 14 are in the site investigation stage, 4 are in the RI/FS or Temporary Remedial Measures stages, 8 are proposed for No Further Remedial Action Planned or monitoring only, and 2 have regulatory closure (U.S. Air Force, 1995e).

The launch complex proposed for the PTC is located on an active IRP site. The soil and groundwater contamination at the site is a result of space program launches in the 1960s and subsequent uses as a burn area for wastes and an oil/water separator for bilge water. Principle contaminants are solvents such as trichloroethelene and PCBs. Cape Canaveral AS has investigated this site, delineated the extent of its contamination, and begun remediation. Contaminated concrete has been removed. Project plans are in place to remove contaminated soils and remediate contaminated groundwater. Contaminated soils are scheduled to be removed and replaced with clean soil when funding is available. The groundwater will be treated to less than 3.5 ppm PCBs. (Kershner, 1998)

A portion of the proposed location for the I&T Complex at Cape Canaveral AS is on previously undisturbed land and has no known contamination. Building 54445 has known soil contamination around the proposed site area.

3.1.6.5 Storage Tanks

Underground storage tanks (USTs) are subject to Federal regulations within RCRA, 42 U.S.C. 6991, and U.S. EPA regulations, Title 40 CFR 265. These regulations were mandated by the Hazardous and Solid Waste Amendments of 1984. Aboveground storage tanks are subject to regulation under the Clean Water Act (CWA) (33 U.S.C. 1251-1578) and oil pollution provisions (40 CFR 112). Under the Florida Administrative Code Chapters 62-761, which are more stringent than Federal regulations, aboveground petroleum storage tanks must be registered if over 2,082 liters (550 gallons) in size; underground petroleum storage tanks are registered if over 416 liters (110 gallons) in size, except those used to store heating fuels. All of the non-petroleum storage tanks are unregulated.

There are no reported storage tanks in the areas proposed for LTF facilities at Cape Canaveral AS.

3.1.6.6 Asbestos

Asbestos-containing material (ACM) abatement is regulated by the U.S. EPA and OSHA. Asbestos fiber emissions into the ambient air are regulated in accordance with Section 112 of the Clean Air Act, which established the National Emissions Standards for Hazardous Air Pollutants. These regulations address the demolition or renovation of buildings with ACM. OSHA regulations cover worker protection for employees who work around or abate ACM. In addition, the requirements in 62-257 F.A.C. must be followed including appropriate notifications to FDEP.

The existing buildings and structures proposed for LTF have not been tested for asbestos. Given the age of the facilities, it is possible that asbestos-containing materials are present. The current Air Force policy is to manage or abate ACM in active facilities, and remove ACM, following regulatory requirements, before facility demolition. ACM is abated when there is a potential for asbestos fiber release that would affect the environment or human health. The Launch Base Support (LBS) contractor revised the Cape Canaveral AS Asbestos Management and Operations Plan in October 1994. Several asbestos surveys were conducted at Cape Canaveral AS between 1992 and 1995.

3.1.6.7 Polychlorinated Biphenyls

Commercial PCBs are industrial compounds produced by chlorination of biphenyls. PCBs persist in the environment, accumulate in organisms, and concentrate in the food chain. PCBs are used in electrical equipment, primarily in capacitors and transformers, because they are not electrically conductive.

The disposal of PCBs is regulated by the Toxic Substances Control Act, which banned the manufacture and distribution of PCBs, with the exception of PCBs used in enclosed systems, in 1978. By Federal definition, PCB equipment contains 500 ppm PCBs or greater, whereas PCB-contaminated equipment contains PCB concentrations of greater than 50 ppm, but less than 500 ppm. The U.S. EPA, under the Toxic Substances Control Act,

regulates the removal and disposal of all sources of PCBs containing 50 ppm or more; the regulations are more stringent for PCB equipment than for PCB-contaminated equipment.

A testing program was implemented by the LBS contractor to identify PCB transformers. While all transformers containing PCBs, as defined by the Air Force, have been removed from Cape Canaveral AS, several small transformers still used in communication equipment are in operation and several mission critical spares are in storage. These transformers have been registered with the U.S. EPA by serial number (Patrick Air Force Base, 1999). Additionally since there is no testing program for other electrical devices, it is possible that there are PCB-containing capacitors on Cape Canaveral AS. Since capacitors come in many sizes and are plentiful within electronic equipment, it is improbable that all of the capacitors containing PCBs have been removed and/or replaced. The Eastern Space and Missile Command Operational Plan 19-16, *PCB Item Control Plan*, was updated by the LBS contractor in July 1997. PCB-contaminated equipment could occur at the existing facilities proposed for modification for LTF. Given the age and operational history of Cape Canaveral AS, PCB-contaminated equipment could occur at the existing facilities proposed for modification for LTF. All equipment in these facilities must be verified or tested for PCBs before proceeding with the modifications.

3.1.6.8 Lead-based Paint

Human exposure to lead has been determined to be an adverse health risk by agencies such as OSHA and U.S. EPA. Sources of exposure to lead include dust, soils, and paint. Waste containing levels of lead exceeding a maximum concentration of 5.0 milligrams per liter, as determined using the U.S. EPA Toxic Characteristic Leaching Procedure that simulates the leaching behavior of landfill wastes, is defined as hazardous under Title 40 CFR 261. If a waste is classified as hazardous, disposal must take place in accordance with U.S. EPA and state hazardous waste rules.

A lead-based paint survey has not been conducted at Cape Canaveral AS. Air Force Policy (1993) ensures that lead-based paint hazards are avoided or abated during building modifications. The existing buildings and structures proposed for LTF may contain lead-based paint. Before any building demolition or modifications, the construction contractor may be required to conduct a lead-based paint survey.

3.1.7 CAPE CANAVERAL AS HEALTH AND SAFETY

The regulatory environment for health and safety issues consists of those regional and local elements that have been established to minimize or eliminate potential risk to the general public and onsite personnel as a result of operations and activities. The ROI for health and safety related impact varies with the type of hazard (occupational and non-occupational), and the type of work activity (construction, support, preparation and launch of rockets and missiles). The occupational ROI is the industrial area of Cape Canaveral AS. The non-occupational ROI includes the public areas of Cape Canaveral AS and surrounding areas that could be affected by operations or a credible accident.

3.1.7.1 Regional Safety

The City of Cape Canaveral, KSC, and the range contractor at Cape Canaveral AS have entered into a mutual aid agreement in the event of an on-station emergency. Each organization may request equipment and manpower in the event of a fire or other emergency. In the event of an emergency involving a launch accident that may affect off-station areas, Cape Canaveral AS contacts the Brevard County Emergency Management Staff. (U.S. Air Force, 1998)

At Cape Canaveral AS and the rest of the Eastern Range, Range Safety monitors launch surveillance areas to ensure the risk to people, aircraft, and surface vessels are within acceptable limits. Control areas and airspace are closed to the public as required. A Notice to Mariners and a NOTAM are published and circulated in accordance with established procedures to provide warning to personnel. (U.S. Air Force, 1998)

3.1.7.2 On-station Safety

Construction and Support Activities

Health and safety for construction and support activities is regulated under Air Force Occupational Safety and Health standards. These standards provide for health and safety programs that are at least as effective as OSHA programs.

Cape Canaveral is part of the Eastern Range. Eastern and Western Range 127-1, *Range Safety Requirements,* (1997) is divided into seven chapters that address all aspects of range safety. Range safety is managed by the 45 SW Range Safety Office and is the responsibility of all 45 SW organizations, tenants, contractors, subcontractors, range users, and visitors to the ranges. The LTF complexes would adhere to the range requirements. Active range safety involvement in a program from the earliest concept phases through launch enhances the chances for a safe program. To implement this, the Air Force has developed the "Concept to Launch" process for missile programs. This process includes an introduction to range safety, tailoring of Eastern and Western Range 127-1 for specific program requirements, noncompliance resolution, flight analysis review, launch vehicle elements and GSE design review, airborne range safety system review, facility design review, operation test review, final range safety approval for launch operations, safety critical launch operations, and final range safety clear to launch. Several of these steps would be applicable to the LTF. The safety review procedure provides a means of substantiating compliance with program safety requirements, and encompasses all systems analyses and testing as required by DOD. (U.S. Air Force, 1998)

Launches and hazardous operations are not allowed at Cape Canaveral AS if an undue hazard to persons and property exists due to potential dispersion of hazardous materials or propagation of blast or other acoustic effects. The 45 SW has prepared a Toxic Hazard Control Plan that details the procedures to be used to control heated toxic gas hazards. Before a launch, an air dispersion computer model, the Rocket Exhaust Effluent Diffusion Model, is run. Inputs to this model include predicted meteorological conditions, probable failure modes, and solid/liquid propellant emission estimates from the launch vehicle

and/or facility. Model scenarios encompass numerous normal and failure modes. The Rocket Exhaust Effluent Diffusion Model produces a Potential Hazard Corridor and plots it in relation to the surrounding community. If the Potential Hazard Corridor encompasses any public area at an unacceptable level, as determined by population density and Brevard Emergency Management Center readiness, the launch is put on hold until more favorable meteorological conditions exist. (U.S. Air Force, 1998)

The laser system final design would ensure personnel would not be exposed to hazardous laser emissions in accordance with Air Force Occupational Safety and Health 161-10. The system would be designed with appropriate interlocks, interrupts, and other safety devices to meet range requirements. Test plans and results would be provided to Range Safety for review and approval as per Eastern and Western Range 127-1.

Emergency responses to major peacetime accidents and natural disasters are covered by the 45 SW Operational Plan 32-1, Volume II. Emergency responses involving hazardous materials are covered by 45 SW Operational Plan 32-3, Volume I. The Disaster Control Group is an emergency response team that is activated for non-launch related disasters at Cape Canaveral AS. The mission of the Disaster Control Group is to minimize the loss of personnel and operational capability caused by wartime contingencies, peacetime disasters, and major accidents including those involving hazardous materials. (U.S. Air Force, 1998)

3.1.8 CAPE CANAVERAL AS LAND USE AND AESTHETICS

This section describes the existing environment in terms of land use and aesthetics for the areas on and surrounding Cape Canaveral AS. Topics addressed are regional land use, on-station/base land use, coastal zone management, and aesthetics. The ROI for these resources at Cape Canaveral AS encompasses the station boundaries and potentially affected adjacent lands.

3.1.8.1 Regional Land Use

Brevard County and the City of Cape Canaveral are the local planning authorities for the incorporated and unincorporated areas near Cape Canaveral AS. Land uses designated by Brevard County for Merritt Island (west of Cape Canaveral) include residential, industrial, public facilities, agricultural, recreation, and conservation. *The City of Cape Canaveral Comprehensive Plan* (U.S. Air Force, 1997) designates residential, commercial, industrial, public facilities and recreation, and open space land use areas, with continued commercial and industrial use of Port Canaveral. Neither the county nor the City of Cape Canaveral has land use authority over Cape Canaveral AS because it is Federally owned. Cape Canaveral AS designates its own land use and zoning regulations. The general plans of the county and City of Cape Canaveral designate compatible land uses around Cape Canaveral AS.

3.1.8.2 On-base Land Use

Cape Canaveral AS encompasses an area of 6,394 hectares (15,800 acres) and is located in the northeast section of Brevard County. Land uses at Cape Canaveral AS include launch operations, launch and range support, airfield, port operations, station support area, and open space (figure 3.1.8-1).

The launch operations land use category is located along the Atlantic Ocean shoreline and includes the active and inactive launch sites and support facilities. The launch and range support area is west of the launch operations area and is divided into two sections by the airfield. The airfield is in the central part of the station and includes a single runway, taxiways, and apron. Port operations take place in the southern part of the station and include facilities for commercial and industrial activities. The major industrial area is located in the center of the western portion of the station, and is included in the station support area category. Although many of the activities are industrial in nature, this land use area includes administrative, recreational, and range support functions. Open space is dispersed throughout the station. There are no public beaches located on Cape Canaveral AS. However, there are recreational activities, such as boating, water skiing, surfing, and fishing, which occur in the ocean areas and rivers surrounding the station. (U.S. Air Force, 1997)

3.1.8.3 Coastal Zone Management

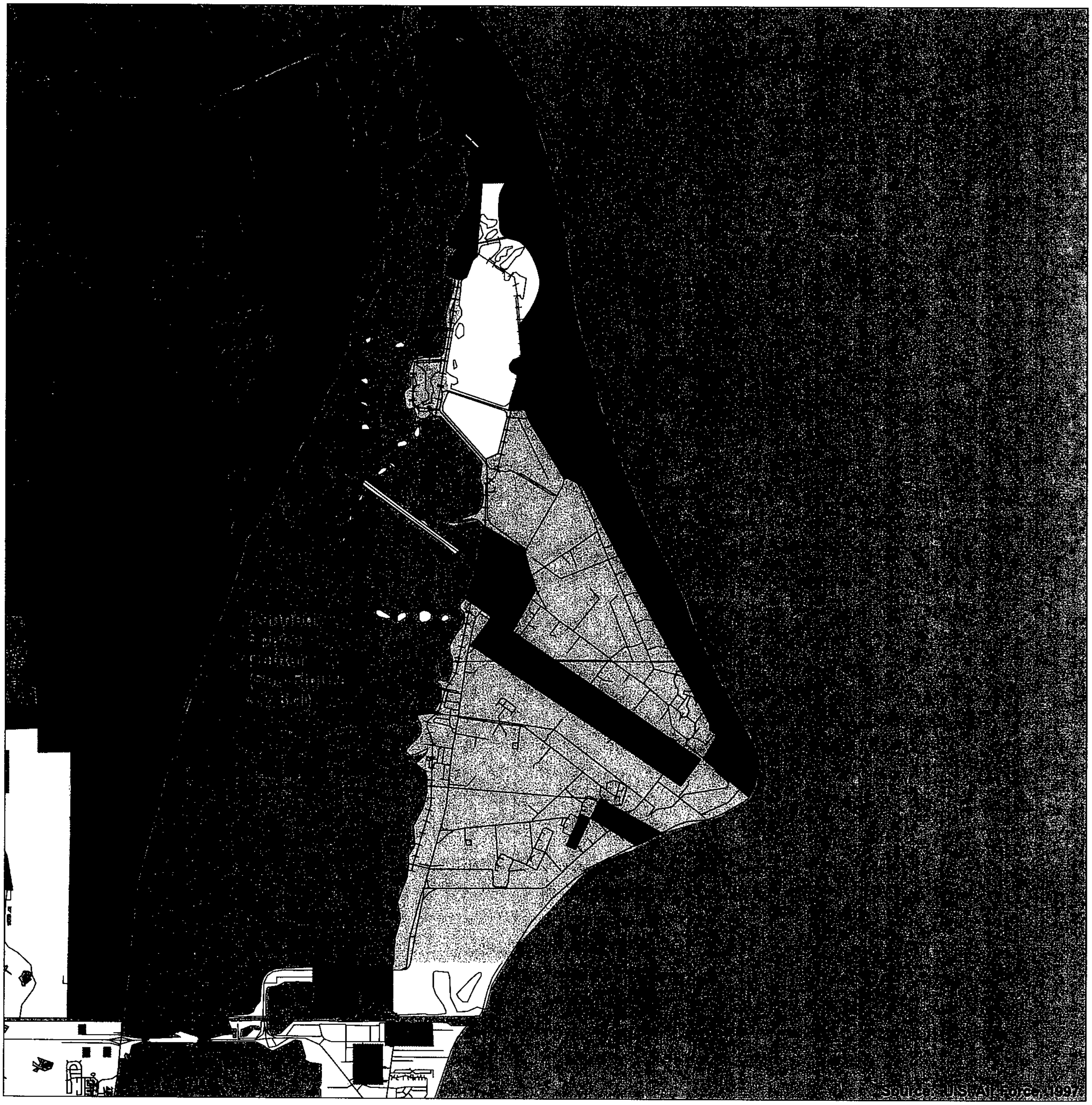
The entire State of Florida is defined as being within the coastal zone; thus, any Federal activity in or affecting a coastal zone in Florida requires preparation of a Coastal Zone Consistency Determination in accordance with the Federal Coastal Zone Management Act of 1972. This act was passed to preserve, protect, develop and where possible, restore or enhance the nation's natural coastal zone resources.

In Brevard County a "no development" zone has been established by the Florida Coastal Management Act (FCMA) in which a no development zone requires a setback of 23 meters (75 feet) from the mean high water level. Cape Canaveral AS has an additional standard for construction near the coast, which requires that facilities be set back at least 46 meters (150 feet) from the coast. The Florida Department of Community Affairs (FDCA) is the state's lead coastal management agency. The Air Force is responsible for making the final coastal zone consistency determinations for its activities within the state, and FDCA reviews the coastal zone consistency determination. (U.S. Air Force, 1997)

3.1.8.4 Aesthetics

The ROI for aesthetics at Cape Canaveral AS includes the general visual environment surrounding the station and the areas visible from off-station areas.

The visual environment in the vicinity of Cape Canaveral AS is characterized by the barrier island on which it is located. Topography of the island is generally flat, with elevations ranging from sea level to approximately 6 meters (20 feet) above sea level (U.S. Air Force, 1997). Cape Canaveral AS is fairly undeveloped with large areas of open space dispersed



EXPLANATION

Launch Operations	Launch and Range Support	Agriculture
Port Operations	NASA	Industrial
Airfield	Residential	Open Space
Station Support Area*	Recreation	Water
		Railways

NORTH

Scale 1:100,000

0 0.8 1.6 Miles

0 1.3 2.6 Kilometers

*This land use includes industrial, administrative, launch and range support, and outdoor recreation areas.

Existing General Land Use on Cape Canaveral AS

Figure 3.1.8-1

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throughout the installation. The most visually significant aspect of the natural environment is the gentle coastline and flat island terrain. The landscape is dominated by Florida coastal stand, coastal scrub, and coastal dune vegetation. The area has a low visual sensitivity because the flatness of the area limits any prominent vistas. The most significant man-made features are the launch complexes and various support facilities.

Since public access to the station is prohibited, viewpoints are primarily limited to marine traffic on the east and west, and to Port Canaveral, Cape Canaveral, and Cocoa Beach to the south. Additionally, views from the north at KSC are available to a limited population.

3.1.9 CAPE CANAVERAL AS NOISE

Noise is defined as "unwelcome or unwanted" sound that is usually caused by human activity and added to the natural acoustic setting of a locale. It is further defined as sound that disrupts normal activities or that diminishes the quality of the environment. Typical noise levels are given in table 3.1.9-1. The ROI for noise is those areas potentially affected by construction and operation activities of the Proposed Action.

Table 3.1.9-1: Noise Levels of Common Sources

Source	Noise Level (dBA)	Comment
Air raid siren	120	At 15.2 meters (50 feet) (threshold of pain)
Rock concerts	110	
Airplane, 747	102.5	At 304.3 meters (1,000 feet)
Jackhammer	96	At 3.0 meters (10 feet)
Power lawn mower	96	At 0.9 meters (3 feet)
Football game	88	Crowd size: 65,000
Freight train at full speed	88–85	At 9.1 meters (30 feet)
Portable hair dryer	86–77	At 0.3 meters (1 foot)
Vacuum cleaner	85–78	At 1.5 meters (5 feet)
Long range airplane	80–70	Inside
Conversation	60	
Typical suburban background	50	
Bird calls	44	
Quiet urban nighttime	42	
Quiet suburban nighttime	36	
Library	34	
Bedroom at night	30	
Audiometric (hearing testing) booth	10	Threshold of hearing without hearing loss

Source: Cowan, 1994.

The characteristics of sound include parameters such as amplitude, frequency, and duration. Sound can vary over an extremely large range of amplitudes. The decibel (dB), a logarithmic unit that accounts for the large variations in amplitude, is the accepted standard unit for the measurement of sound. Different sounds may have different frequency contents. When measuring sound to determine its effects on a human population, A-weighted sound levels (dBA) are typically used to account for the frequency response of the human ear.

Background Noise Levels off Cape Canaveral AS

Most of the region surrounding Cape Canaveral AS is open water, with the Atlantic Ocean to the east and the Banana River to the west. Immediately north of Cape Canaveral AS is KSC, and to the south is Port Canaveral. This relative isolation of the station reduces the potential for noise to affect adjacent communities. The closest residential areas to Cape Canaveral AS are to the south, in the cities of Cape Canaveral and Cocoa Beach. Expected sound levels in these areas are normally low, with higher levels occurring in industrial areas (Port Canaveral) and along transportation corridors. Residential areas and resorts along the beach would be expected to have low overall noise levels, normally about 45 to 55 dBA. Infrequent aircraft flyovers from Patrick AFB and missile launches from Cape Canaveral AS would be expected to increase noise levels for short periods of time. The launch of space vehicles from Cape Canaveral AS and KSC does generate intense, but relatively short-duration, noise levels of low frequencies. The highest recorded levels are those associated with the Titan IV and Space Shuttle, which can exceed 160 dBA in the launch vicinity. Noise levels at Port Canaveral would be expected to be typical of an industrial facility reaching levels of 60 to 80 dBA. (U.S. Air Force, 1997)

Background Noise Levels on Cape Canaveral AS

An additional source of noise in the area is the Cape Canaveral AS airfield. Because of the infrequent use of this airfield, noise generally does not affect public areas. Other less frequent but more intense sources of noise in the region are space launches from Cape Canaveral AS. Current launches include Delta, Atlas, Titan, and Trident. The A-weighted noise levels from launch vehicles can be as high as 120 dBA at approximately 900 meters (3,000 feet) from the launch site, depending on the launch vehicle. (U.S. Air Force, 1997)

Following liftoff, launch vehicles gain altitude, pitch over, and accelerate quickly. When flight speed exceeds the speed of sound, sonic shock waves develop. When these shock waves intersect with the ground, they produce a sonic boom. Sonic booms produced during vehicle ascent occur over the Atlantic Ocean, and are directed upward and in front of the space vehicle. Sonic booms generated from launches at Cape Canaveral AS do not impact developed areas. (U.S. Air Force, 1997)

3.1.10 CAPE CANAVERAL AS SOCIOECONOMICS

Socioeconomic resources describe the social and economic characteristics of a community or region by analyzing variables and indicators that include population and employment. This section provides a socioeconomic overview of the region surrounding Cape Canaveral.

3.1.10.1 Region of Influence

For the purposes of this analysis, the region surrounding Cape Canaveral AS is defined as an area that includes those communities within approximately 1 hour's drive from the proposed test site. The drive time is delineated by using a computer program that assumes a journey carried out within the legal speed limits and in moderate traffic densities. Figure 3.1.10-1 illustrates the extent of the region. While the drive time polygon covers all or part of five counties, four counties constitute the majority of the defined region. These four counties are Brevard, Orange, Seminole, and Volusia, and they include the communities of Titusville and parts of Orlando and Melbourne.

Each of the four counties that compose the major part of the 60-minute drive time rank within the top 12 most populated of 67 Florida counties. Orange County, which contains Orlando, had the sixth highest population in Florida in 1995.

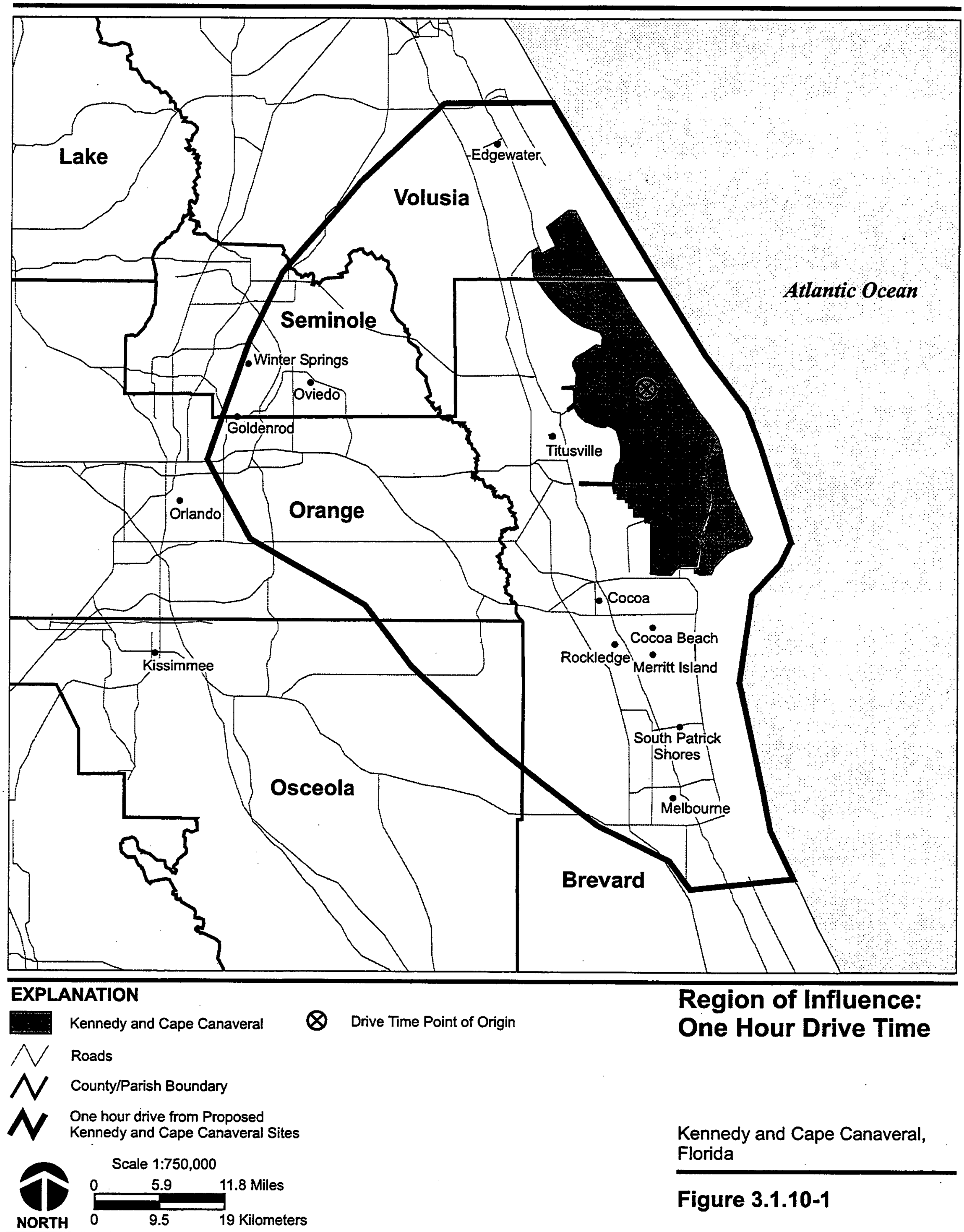
3.1.10.2 Population

In 1997, there was a population of 624,000 within a 60-minute drive of the test site. This population is forecast to increase annually, by 1.8 percent, to 682,280 by 2002. A straight-line projection suggests that the population will grow to 719,830 by 2005.

Those referred to as economically active (18 years and older) constitute 77 percent of the regional population. Despite a discernible trend in the aging of the local population, this proportion remains constant through 2005. The median age of the region's population was 37.4 years in 1997 and is expected to rise to about 40.9 years of age by 2005.

3.1.10.3 Employment

The four counties of Brevard, Orange, Seminole, and Volusia had over 760,000 non-Federal jobs in 1993. If the forecast 1993–2005 growth rate in jobs for the State of Florida is applied to the four-county area, there would be approximately 990,000 jobs in the region by 2005, or an increase of 30 percent over a 12-year period.



Region of Influence: One Hour Drive Time

Kennedy and Cape Canaveral, Florida

Figure 3.1.10-1

3.1.11 CAPE CANAVERAL AS TRANSPORTATION

The ROI for transportation potentially affected by the LTF program at Cape Canaveral AS includes key Federal, state, and local roads within north and central Brevard County, and any waterways that provide access to Cape Canaveral AS. Local rail networks and airway facilities are described.

The evaluation of existing roadway conditions focuses on capacity, which reflects the network's ability to serve traffic demand and volume. Capacity is stated in terms of vehicles per hour, and is the maximum number of vehicles that can be effectively processed by a segment of roadway or intersection during 1 hour. (U.S. Air Force, 1997)

Roadway capacity is a function of several factors including the number of lanes, lane and shoulder width, traffic control devices (e.g., traffic signals), and percentage of trucks. For two-lane roads, capacity analysis is conducted for both directions; for multilane highways, capacity analysis considers a single direction only.

To determine how well a section of roadway operates, capacity is compared to the volume of traffic carried by the section. Traffic volumes may be distinguished as (1) average annual daily traffic, the total two-way volume averaged for a full year; (2) average daily traffic (ADT), the total two-way traffic averaged for a period of time less than 1 year; and (3) peak-hour volume, the amount of traffic that occurs in the typical peak hour. Average annual daily traffic estimates in this section were developed by applying factors to short counts (ADTs), since no continuous-count locations are within the study area.

An assessment of peak-hour volumes and roadway capacity is conducted to establish the Level of Service (LOS) during the peak hour. The LOS, a qualitative measure describing operational conditions within a traffic stream, ranges from A to F. Each level is defined by a range of volume-to-capacity ratios. LOS A, B, and C are considered good operating conditions where minor or tolerable delays are experienced by motorists. LOS D and E represent acceptable but below-average conditions. LOS F represents an unacceptable situation of unstable stop-and-go traffic.

Roadways

Major roadways, in terms of capacity to move people and goods within Brevard County and accessibility to Cape Canaveral AS, are the basic structure upon which the rest of the system relies for proper function. (East Central Florida Regional Planning Council, 1995b) The NASA Causeway and Beach Road connect KSC and Cape Canaveral AS. Public access gates allow entry to both installations, and a great deal of vehicular traffic passes through each to access the other, not subject to security checks due to an unofficial reciprocity agreement (Cape Canaveral Air Station 45th Space Wing, 1996). In view of the contiguous nature of these installations, table 3.1.11-1 includes key roadways providing access for both.

Table 3.1.11–1: Cape Canaveral AS/KSC Area Roadways

Roadway	Lanes	Direction	City/Roadway Links	Segment	Capacity (ADT)
Off-installation					
I-95		N-S	Rockledge, Melbourne, beach areas, Patrick AFB	North of SR-528	16,500
US-1	4	N-S	Pineda Causeway to SR-520	North of SR-50	13,500
				North of SR-528/A1A	N - 17,500; S - 18,500
SR-A1A	4	N-S	Cape Canaveral, Cocoa Beach, north beaches	South from Samuel C. Phillips Parkway	N - 17,500; S - 17,000
				East from Samuel C. Phillips Parkway	14,500
SR-3 (South Kennedy Parkway)		N-S (JFK Gate 2; Cape Canaveral AS Gate 3)	Merritt Island	North of SR-528	N - 10,500; S - 13,500
SR-401 (Samuel C. Phillips Parkway) [1]	5(4)	N-S (Cape Canaveral AS Gate 1)	Cape Canaveral, Cocoa Beach, south beach communities	North of SR-528	N - 7,600; S - 8,200
SR-405 (NASA Causeway)	4	E-W	Titusville, No. Brevard Co.	Between U.S. 1 and Samuel C. Phillips Parkway	E - 9,500; W - 12,500
SR-406 (Titusville Road)	2	SW-NE (KSC Gate 4)	Titusville, Beach Road, North Kennedy Parkway	West of US-1	16,500
SR-520	4	NW-SE	Cocoa, Rockledge, Merritt Island	West of SR-A1A	E - 11,000; W - 12,500
SR-528 (Martin Anderson Bee Line Expressway, Bennett Causeway)	4	E-W	Cocoa, Merritt Island	East of US-1 (SR-5)	22,500

Source: National Aeronautics and Space Administration, 1992; U.S. Air Force, 1997; 1998.
[1] Narrows from 5- to 4-lane divided road at Cape Canaveral AS Gate 1; at this point, becomes Phillips Parkway, continuing northward through Cape Canaveral AS and leading onto KSC.
ADT = Average daily traffic, SR = State Road

Table 3.1.11-1: Cape Canaveral AS/KSC Area Roadways (Continued)

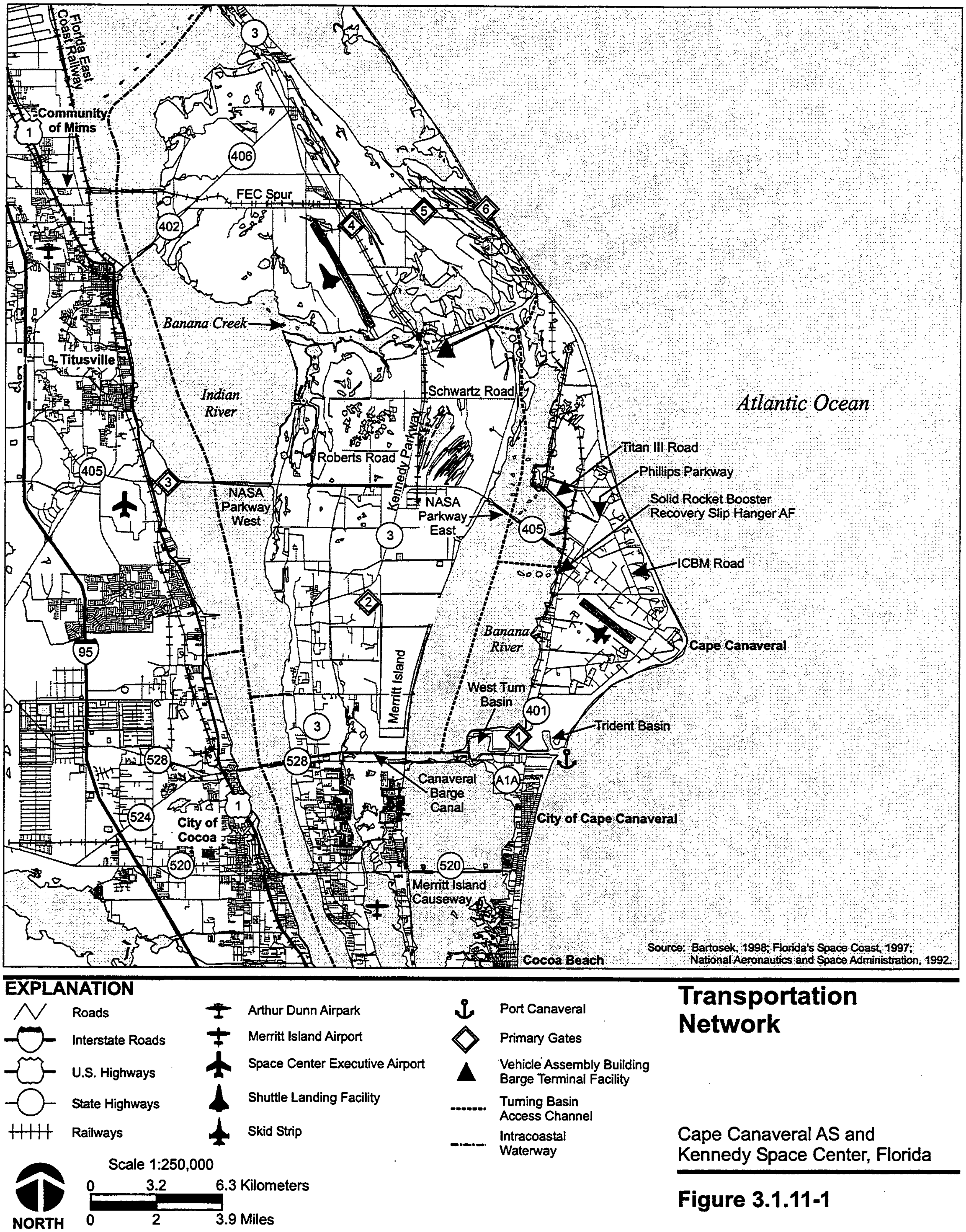
Roadway	Lanes	Direction	City/Roadway Links	Segment	Capacity (ADT)
Cape Canaveral On-installation					
Central Control Road	2	E-W		–	N/A
ICBM Road		N-S	Phillips Parkway	–	N/A
Industry Road (NASA Causeway)		E-W	NASA Causeway	–	N/A
Samuel C. Phillips Parkway/Hangar Road	4	N-S	SR-401	Between Gate 1 and SR-401 (Gate 6)	N/A
Titan III Road		NW-SE	Phillips Parkway		N/A
KSC On-installation					
Schwartz Road West	2	E-W	Kennedy Parkway S		N/A
Roberts Road	2	E-W	Kennedy Parkway S		N/A

Source: National Aeronautics and Space Administration, 1992; U.S. Air Force, 1997; 1998.
(1) Narrows from 5- to 4-lane divided road at Cape Canaveral AS Gate 1; at this point, becomes Phillips Parkway, continuing northward through Cape Canaveral AS and leading onto KSC.
ADT = Average daily traffic, N/A = Information not available, SR = State Road

Off-installation Network

Several roadways comprise a network providing access into Cape Canaveral AS (figure 3.1.11-1). The installation can be accessed from Daytona Beach and other locations via US-1, a divided highway running from the Pineda Causeway (State Road [SR]-404) to SR-520, or I-95. Orlando lies approximately 81 kilometers (50 miles) to the west on SR-528, and Miami is approximately 301 kilometers (187 miles) to the south on US-1 or I-95 (U.S. Air Force, 1997). A major transportation corridor, I-95 is a limited-access highway passing west of the base and used predominantly for through traffic, connecting the state with the entire Eastern Seaboard (East Central Florida Regional Planning Council, 1995b).

The majority of Cape Canaveral AS employees reside within 22.5 kilometers (14.0 miles) of the installation, in areas of unincorporated Brevard County and the cities of Cape Canaveral, Cocoa, Cocoa Beach, and Rockledge. In addition to I-95 and US-1, SR-A1A, SR-3, SR-401, SR-405, SR-520, and SR-528 also access the installation. SR-A1A is a divided highway running immediately adjacent to the Atlantic coast; it approaches SR-528 from the south and is a major transportation corridor for both Cape Canaveral AS and Patrick AFB employees. SR-401, a primary access route to Cape Canaveral AS, becomes General Samuel C. Phillips Parkway as it approaches Gate 1. Persons traveling SR-A1A from the City of Cape Canaveral to points south, as well as those from the Orlando area



Transportation Network

Cape Canaveral AS and Kennedy Space Center, Florida

Figure 3.1.11-1

on SR-528, generally access the base via SR-401 (Cape Canaveral Air Station 45th Space Wing, 1996). SR-3 provides access from the south through its connection with SR-405, an arterial that becomes the NASA Causeway upon entering KSC and is thus another primary northerly access route to Cape Canaveral AS (Cape Canaveral Air Station 45th Space Wing, 1996). SR-520 is an urban roadway serving as a regional corridor through Cocoa, continuing east to SR-A1A (U.S. Air Force, 1997). SR-528 (the Martin Anderson Bee Line Expressway or Bennett Causeway) is a limited-access toll road which approaches Cape Canaveral AS from the west, connecting the base with Orlando and thus linking mainland Florida, Merritt Island, and the barrier islands (Cape Canaveral Air Station 45th Space Wing, 1996).

On-installation Network

Cape Canaveral AS roadways provide access to launch complexes, support facilities, and industrial areas. During peak hours, traffic flow remains steady, and significant delays seldom occur. Central Control Road, a primary arterial, adjoins Phillips Parkway, connecting it with Lighthouse Road. Industry Road, another primary arterial, proceeds westward from the parkway, becoming the NASA Causeway at the KSC boundary (Cape Canaveral Air Station 45th Space Wing, 1996). Samuel C. Phillips Parkway is the principal onsite arterial, a divided highway accommodating most of the north-south traffic; at its intersection with Skid Strip Road, it becomes a one-way, northbound arterial, whereas the southbound lanes are an extension of Hangar Road from the north (Cape Canaveral Air Station 45th Space Wing, 1996). ICBM Road is the primary access road to many of the launch complexes (Cape Canaveral Air Station 45th Space Wing, 1996). Phillips Parkway, along with Titan III Road (in the Building 54445 area) and ICBM Road, accessing LC-15, are the primary roads potentially affected by LTF activities.

Waterways—Off-installation

Abutting the southern boundary of the installation is Port Canaveral, the nearest anchorage with docking facilities (Patterson, 1998). Small boat facilities include five marinas, several cargo piers with drafts ranging from 11 to 12 meters (35 to 39 feet), and numerous cruise ship terminals (Canaveral Port Authority, 1997). Sea buoy to berth travel time is 45 minutes. Total ship calls for FY 1997 were 337 cargo, 45 layberth, and 1,113 cruise. (DeClaire, 1998) Cruise passengers for FY 1997 totaled 1,429,554 (Canaveral Port Authority, 1997). Cargo for 1996 totaled 3.24 million metric tons (3.57 million tons) (U.S. Army Corps of Engineers, Water Resources Support Center, 1996) and, for FY 1997, 3.2 million metric tons (3.5 million tons) (DeClaire, 1998).

Waterways—On-installation

The Cape Canaveral AS Port Operations Zone occupies 74.5 hectares (184 acres) on north Port Canaveral, where locks connect the harbor to the Banana River. NASA vessels use this access; berthing for NASA recovery vessels is located on the Banana River, west of Hanger AF in the Cape Canaveral AS Industrial Area. Two of the port's turning basins are utilized by both military and civilian vessels, whereas the third (eastern) basin, constructed for the Navy Trident program, is reserved for military vessels exclusively. (Cape Canaveral Air Force Station, 1992) Military activities have increased considerably in support of Fleet

Ballistic Missile operations; in addition, commercial/industrial activities have expanded into the port's west side, adjacent to the south boundary of Cape Canaveral AS. The port also contains the Air Force berthing facility, and two deep-draft Navy wharves.

Docks at the Hangar AF Wharf are primarily employed in Solid Rocket Booster retrieval. The Turning Basin Wharf/External Tank Barge Dock is used to unload Space Shuttle external fuel tanks and other heavy equipment suited to waterway transport. (National Aeronautics and Space Administration, 1997a)

Railways—Off-base Facilities

The ROI for railways includes the Florida East Coast Railway, servicing the county via a main line through Titusville, Cocoa, and Melbourne (U.S. Air Force, 1997). The line parallels US-1, carrying from 9 to 18 million metric tons (10 to 20 million tons) of cargo annually (East Central Florida Regional Planning Council, 1995b) and connecting with the CSX and Norfolk Southern railways (East Central Florida Regional Planning Council, 1995b). Spur rail lines serve other parts of Brevard (U.S. Department of the Air Force and National Aeronautics and Space Administration, 1993). CSX offers rail freight service with a main line running through Orlando. Amtrak passenger terminals are located at Orlando and Winter Park; the "Autotrain," transporting both automobiles and passengers, is available 16 kilometers (10 miles) northeast of Orlando in Sanford (Cape Canaveral Air Station 45th Space Wing, 1996).

Railways—On-base Facilities

Florida East Coast operates a restricted spur-line (figure 3.1.11-1), by permit only, extending from KSC and Titusville via the main line north of Cape Canaveral AS and terminating within the installation at the Titan area (U.S. Air Force, 1997).

Airways—Off-base Facilities

The major airport serving Brevard County is Melbourne International Airport, a 1,133-hectare (2,800-acre) airport located approximately 48 kilometers (30 miles) south of Cape Canaveral AS. In order to accommodate long-range, international, non-stop flights, an approved project is pending to strengthen and lengthen the runway to 3,540 meters (11,600 feet) (Melbourne International Airport, 1997). Local commercial and executive airports are Titusville's Space Coast Regional (formerly Space Center Executive) Airport and Merritt Island Airport. Both offer asphalt-surfaced, lighted runways with aircraft tiedowns (Patterson, 1998) and are within 1 hour's drive of LC-15. In addition, there are two local C5A-compatible, fixed-base operators with asphalt runways, Rockledge (formerly Greens) Air Park and the Arthur Dunn Airport (Cape Canaveral Air Station 45th Space Wing, 1996). However, Rockledge is currently a private airport and unavailable for commercial flights (Sung, 1998). Regional air services are more than adequate, and are described in table 3.1.11-2.

Table 3.1.11-2: Cape Canaveral AS/KSC Available Airway Facilities

Airport/Airfield	Runway length meters (feet)	Runway width meters (feet)	Passengers	Flights	Load Capacity kilograms (pounds)
Off-installation					
Melbourne International	2,890 (9,481)	46 (150)	Enplanements - 321,188 [1]; Deplanements - 313,556 [1]	42/day	n/a
Space Coast Regional					
18-36:	1,829 (6,001)	46 (150)	n/a	130,000/ year[2]	Single-wheeled: 72,576 (160,000); dual- wheel, single-axle: 99,792 (220,000); dual-wheel, tandem- axle: 172,368 (380,000)
9-27:	1,524 (5,001)	30 (100)	n/a		
Merritt Island	1,098 (3,600)	23 (75)	250,000	100,000	n/a
Arthur Dunn					
15-33:	914 (3,000)	21 (70)	125,000[2]	50,000 [2]	n/a
4-22:	546 (1,790)	30 (100)			n/a
On-installation					
Skid Strip (Class B)	3,048 (10,000)	91 (300)	n/a	28,000 [3]	Rated for C-5 aircraft
Shoulders		23 (75)			
Stabilized overruns	305 (1,000)	137.2 (450)			
Shuttle Landing Facility (15-33)	4,572 (15,000)	91.4 (300)	No commercial	15,000 [5]	Unlimited
Overruns (each end)	305 (1,000) [4]	91.4 (300)			

Source: Cape Canaveral Air Force Station, 1992; Cooksey, 1999; Hutto, 1998; Kennedy Space Center, 1998b; Mason, 1998; Melbourne International Airport, 1997; National Aeronautics and Space Administration, 1992; Patterson, 1998; Taff, 1999; Titusville-Cocoa Airport Authority, 1998; 1999.

[1] Figures for 1997.

[2] Totals for all runways.

[3] Estimated annual operations, per Cooksey. This includes overflights and "touch and go" operations, and amounts to 14,000 aircraft.

[4] Giving a total length of 5.2 kilometers (3.2 miles).

[5] Figures for 1998. For the Shuttle Landing Facility, approximately 50 percent are "flyovers." Total aircraft would be about 7,500.

Airways—On-base Facilities

The Cape Canaveral AS Airfield Operation Zone comprises 483 hectares (1,193 acres) on an isolated peninsula with a single runway referred to as the Skid Strip. All other military traffic is directed to Patrick AFB, which also controls the Skid Strip. Civilian traffic is directed to the aforementioned non-military airfields. (Cape Canaveral Air Station 45th Space Wing, 1996) The Skid Strip accommodates aircraft in direct support of missile launches, missile component delivery, or carrying government personnel. Land on the runway's east end allows the option of extending the runway 1,520 kilometers (5,000 feet); however, there are currently no plans for expansion (Cape Canaveral Air Force Station, 1992; Cape Canaveral Air Station 45th Space Wing, 1996). Currently, Skid Strip operations are relatively below average (Cooksey, 1999).

3.1.12 CAPE CANAVERAL AS UTILITIES

The utility systems addressed in this analysis include facilities and infrastructure used for potable water supply, wastewater, solid waste, and electricity/natural gas. Utility influences do not exhibit an associated ROI in the same manner as other disciplines. The utilities ROI is the entire domain potentially affected (either directly or indirectly) by project activities. All or portions of the service areas of each utility provider that serves Cape Canaveral AS and the local communities compose the ROI, whose major attributes are processing, distribution, and storage capacities and related factors (such as average daily consumption), needed to determine adequacy of such systems to provide future service.

3.1.12.1 Water Supply

Off-installation

Brevard County potable water is obtained from a shallow aquifer (north), the Floridan Aquifer (central), and Lake Washington (south). The cities of Cocoa and Melbourne are the county's largest potable water suppliers. Brevard County, Titusville, and the City of Palm Bay Utilities Corporation supply the remainder. The St. Johns River Water Management District has designated Brevard County as a water resource caution area (East Central Florida Regional Planning Council, 1995a), a geographic area where water resources are critical, or are anticipated to become critical by 2010.

The City of Cocoa provides potable water, via the Floridan Aquifer, to its own residents, Cocoa Beach, Cape Canaveral, Rockledge, Patrick AFB, and much of the unincorporated central county. Currently, the city's Dyal Water Treatment Plant (WTP) has a rated capacity of 167 million liters (44 million gallons) per day and a well field capacity of 182 million liters (48 million gallons) per day (Larrabee, 1998). In addition, an Aquifer Storage Recovery System (which stores finished water that is recovered as needed) allows a supplemental 30 million liters (8 million gallons) per day, giving a potential 197 million liters (52 million gallons) per day (Larrabee, 1998). Average daily flow increased from 85 million liters (22 million gallons) per day in 1990 to 96 million liters (25 million gallons) per day in 1996. The Dyal WTP expansion is under construction to meet water needs in the year 2000, when maximum demand is projected to exceed 170 million liters (45 million

gallons) per day (City of Cocoa, 1998). The plan requires a WTP capacity of 182 million liters (48 million gallons) per day and a storage recovery capacity of 45 million liters (12 million gallons) per day by November 1999 (Larrabee, 1998).

The City of Melbourne supplies drinking water for its citizens and for Melbourne Beach, Indialantic, Indian Harbour Beach, and surrounding areas. The total drinking water capacity is 87.1 million liters (23.0 million gallons) per day. Daily demand is approximately 53 million liters (14.0 million gallons), with a maximum of 58.7 million liters (15.5 million gallons) and a peak hourly demand of approximately 75.7 million liters (20.0 million gallons). (City of Melbourne, undated) Palm Bay Utilities provides water to the Palm Bay area via a 37.9 million-liter (10.0-million-gallon) per day WTP and a 9.1-million-liter (2.4-million-gallon) per day water reclamation facility (City of Palm Bay, 1996).

On-installation

Cape Canaveral AS receives its potable water from the City of Cocoa. When necessary, Melbourne water can be supplied through Patrick AFB (Cape Canaveral Air Station 45th Space Wing, 1996) and KSC. Cape Canaveral AS, KSC, and Patrick AFB are contracted to receive up to 24.6 million liters (6.5 million gallons) per day, but usage averages about 9.5 million liters (2.5 million gallons) per day (Crouch, 1998; Larrabee, 1998). Of the 49 on-base wells, none are used as potable water sources; however, six are on standby to support the St. Johns River Water Management District.

In 1995, water consumption within the ROI averaged 95 million liters (25 million gallons) per day; of this, Cape Canaveral AS used an average 2.8 million liters (0.75 million gallons) per day and has a system capacity of 11 million liters (3 million gallons) per day (U.S. Air Force, 1998).

Peak usage of 4.2 million liters (1.1 million gallons) per day occurs on launch days (Cape Canaveral Air Station 45th Space Wing, 1996). Total water storage capacity is 2.5 million liters (0.65 million gallons) in two elevated tanks and 22.3 million liters (5.9 million gallons) in ten ground-level tanks (Cape Canaveral Air Station 45th Space Wing, 1996).

3.1.12.2 Wastewater

Off-installation

Unincorporated areas of Brevard County are served by eighteen public wastewater treatment plants (WWTPs), each with the capacity to treat at least 3.8 million liters (1 million gallons) per day. The largest is the South Beach Regional WWTP, processing over 34.1 million liters (9 million gallons) of wastewater daily (East Central Florida Regional Planning Council, 1995a). In 1992, the county had an existing wastewater treatment capacity of 209 million liters (55 million gallons) per day with an unallocated capacity of 63 million liters (16.7 million gallons) per day to meet future growth.

On-installation

Cape Canaveral AS treats both domestic and industrial wastewater onsite at a WWTP maintaining a permitted capacity of 3.3 million liters (0.87 million gallons) per day and a peak daily flow of 1.1 million liters (0.3 million gallons) per day; design capacity is 7.6 million liters (2 million gallons) per day. An industrial wastewater permit allows Cape Canaveral AS to discharge deluge water to grade or to pump to the WWTP for treatment (U.S. Air Force, 1998) as an alternative to the current practice of allowing expended water to flow to percolation ponds. However, this discharge to the WWTP is only considered on an emergency basis and likely only when launch time-frame constraints would not allow discharge of treated deluge water that meets FDEP state standards to the groundwater. Current peak wastewater generation at Cape Canaveral AS is 2.4 million liters (0.63 million gallons) per day. Future plans include connecting the KSC sewage system with that of Cape Canaveral AS.

3.1.12.3 Solid Waste

Off-installation

The primary county landfill is Cocoa's Central Disposal Facility, handling both Class I and Class III wastes. The Sarno Road Landfill, located in the county's south end, is devoted to Class III waste (Barr, 1998). The Central Disposal Facility receives between 1,996 to 2,177 metric tons (2,200 and 2,400 tons) of solid waste daily, with an estimated fill date of 2015. Sarno has a remaining capacity of roughly 2.3 million cubic meters (3 million cubic yards), with an estimated close date of 2016, and processes 29,151 cubic meters (38,128 cubic yards) per month. (Barr, 1998)

On-installation

The on-station Class III landfill near the Skid Strip only accepts construction and demolition debris, ACM, and WWTP sludge. Of 74 hectares (182 acres) available, only 22 hectares (55 acres) are currently in use. The remainder is either closed or remains natural scrub habitat available for future expansion. General solid waste and construction debris is typically disposed at the Central Disposal Facility (U.S. Department of the Air Force and National Aeronautics and Space Administration, 1993). In 1995, Cape Canaveral AS disposed of 1,891 metric tons (2,085 tons) of construction and demolition debris, 23,175 metric tons (25,546 tons) of concrete, 679 metric tons (748 tons) of ACM (U.S. Air Force, 1998) for a total of 25,745 metric tons (28,379 tons).

3.1.12.4 Energy

Electricity—Off-installation

Florida Power and Light supplies electricity to Brevard County. Regional power demand has increased during the last few years and is extremely high during peak loading conditions (Cape Canaveral Air Station 45th Space Wing, 1996). The 36 county substations have an existing capacity of 2,380 megavolt-amperes with a current load of 1,232 megavolt-amperes, or 52 percent usage; this capacity represents current availability, but less than 50 percent of potential future capacity (Cain, 1998).

Electricity—On-installation

Florida Power and Light supplies electricity to Cape Canaveral AS through a 240/138-kilovolt (kV) switching station (U.S. Department of the Air Force and National Aeronautics and Space Administration, 1993). Transmission lines enter at three locations: the southwestern boundary (South Cape Substation); the NASA Causeway (North Cape Substation); and Merritt Island (to the Titan Substation). Transformers convert the transmission voltage to a distribution voltage of 13.2 kV. The north and south substations have a capacity of 20 megavolt-amperes and the Titan Substation has a capacity of 15 megavolt-amperes. In addition to these, there are 170 other substations converting distribution voltage to user voltages. (Cape Canaveral Air Station 45th Space Wing, 1996) Figures for 1995 indicate Cape Canaveral AS consumed 864,000 kilowatt-hours (kWh) per day of the total 220,000,000 kWh per day delivered to Brevard County (U.S. Air Force, 1998).

Natural Gas—Off-installation

Brevard County's natural gas distributor is City Gas Company of Florida (Patterson, 1998), serving Merritt Island, Cocoa, Cocoa Beach, and Titusville, among others (NUI Corporation, undated). Brevard County's 1997 natural gas throughput was 27.3 million therms; estimated 1998 throughput is 30 million therms (Stark, 1998).

Natural Gas—On-installation

In 1999, Cape Canaveral AS completed installation of a natural gas system; City Gas distribution lines run along the existing right-of-way, beginning at the eastern limits of KSC's General Support Zone and terminating at the south Cape Canaveral AS gate (Kennedy Space Center Environmental Program Office, 1997). Currently, certain facilities utilize liquid petroleum as an alternative fuel.

3.1.13 CAPE CANAVERAL AS WATER RESOURCES

Water resources include surface water and groundwater and their physical, chemical, and biological characteristics. The water resource section provides an overview of the ground and surface water features, flood hazard areas, and water quality in the vicinity of Cape Canaveral AS. In general, the ROI for groundwater is the local aquifers that are directly or indirectly used by Cape Canaveral AS. The ROI for surface water is the drainage system/watershed in which the station is located.

Water Resource Regulations

The Federal Water Control Amendments of 1972, commonly known as the CWA, established a national strategy to restore and maintain the chemical, physical, and biological integrity of the nation's water. Under the CWA, the U.S. EPA is the principal permitting and enforcement agency. This authority may be delegated to appropriate state agencies. The CWA functions primarily by requiring permits for activities that result in the discharge of water pollutants from both point sources (i.e., discharge pipes, ditches, etc.)

and non-point sources (i.e., agricultural lands, construction sites, and dredge and fill operations).

The 1987 amendments to the CWA required the U.S. EPA to establish a National Pollutant Discharge Elimination System (NPDES) permit program for storm water discharges associated with industrial activities. The regulation has four different NPDES application processes: an individual permit application, a multi-sector general permit application, and two general permit applications. Industrial operations that result in the discharge of storm water pollutants are permitted under an individual, multi-sector, or general industrial permit. A general construction permit application is required for construction activities that result in the disturbance of 2 hectares (5 acres) or more in area. This general construction permit also requires the preparation of an SWPPP.

Storm water management activities within the State of Florida are also governed by the Florida Environmental Resource Permit (ERP) program. The ERP program applies to alterations of the landscape, including the creation or alteration of wetlands and other surface waters, and alterations of uplands that affect flooding and all storm water management activities. Under the ERP program, the permit application serves as a joint application to initiate review by the FDEP and USACE. The FDEP utilizes the ERP application for the concurrent review of State of Florida storm water management requirements, as an application for use of state-owned submerged lands, and for ensuring compliance with state water quality standards. The St. Johns River Water Management District enforces State of Florida storm water management requirements at Cape Canaveral AS.

3.1.13.1 Groundwater

Two aquifer systems underlie Cape Canaveral AS: the surface aquifer and the Floridan Aquifer. The surface aquifer system, which is composed of sand and marl, is under unconfined conditions (capable of being recharged due to the lack of an impermeable layer) and is approximately 21 meters (70 feet) thick. The seasonal water table below Cape Canaveral AS is generally located a few meters (approximately 10 feet) below the ground surface. Recharge to the surface aquifer is principally by precipitation. Groundwater in the surface aquifer at Cape Canaveral AS generally flows to the west. (U.S. Air Force, 1997)

A confining unit composed of clays, sands, and limestone separates the surface aquifer from the underlying Floridan Aquifer. The confining unit is generally 24 to 37 meters (80 to 120 feet) thick. The relatively low hydraulic conductivity of the confining unit restricts the vertical exchange of water between the surface aquifer and the underlying confined Floridan Aquifer (U.S. Air Force, 1997).

The Floridan Aquifer is the primary source of potable water in central Florida and is composed of several carbonate units with highly permeable zones. The top of the units occurs at a depth of approximately 55 meters (180 feet) below ground surface, and the carbonate units extend to a depth of several hundred feet. The permeability of the

Floridan Aquifer is generally very high, yielding large quantities of water (U.S. Air Force, 1997).

3.1.13.2 Surface Water

Cape Canaveral AS is located on a barrier island that separates the Banana River from the Atlantic Ocean. Cape Canaveral AS is within the Florida Middle East Coast Basin. This basin contains three major bodies of water in proximity to the station: the Banana River to the immediate west, Mosquito Lagoon to the north, and the Indian River to the west. All three water bodies are estuarine lagoons, with circulation provided mainly by wind-induced currents (U.S. Air Force, 1997).

Several water bodies in the Middle East Coast Basin have been designated Outstanding Florida Waters in FAC 17-3, including most of Mosquito Lagoon and the Banana River, Indian River Aquatic Preserve, Banana River State Aquatic Preserve, Pelican Island National Wildlife Refuge, and Canaveral National Seashore. The Outstanding Florida Waters designation affords the highest level of protection to these waters, and any compromise of ambient water quality is prohibited. Additionally, the Indian River Lagoon System has been designated an Estuary of National Significance by the U.S. EPA. Because of these designations, as well as other Florida regulations designed to minimize discharges and urban water runoff in the area, water quality in the Middle East Coast Basin is expected to improve (U.S. Air Force, 1996).

Surface drainage at Cape Canaveral AS generally flows to the west into the Banana River. The Banana River has been designated a Class III surface water, as described by the CWA of 1977. Class III standards are intended to maintain a level of water quality suitable for recreation and the production of fish and wildlife communities. There are no wild and scenic rivers located on or near Cape Canaveral AS (U.S. Air Force, 1997).

Storm drainage is separated from the sewer system and is "open" in part and "closed" in part. The former conveys runoff overland via cross-connecting canals, gutters, channels, and swales, to outfalls at the Banana River; the latter consists of catch basins, pipes, and connections beneath the drainage area, discharging into either drainage canals or the Banana River. Runoff is reduced by percolation into the sandy soil. (Cape Canaveral Air Station 45th Space Wing, 1996) In October 1996, the Cape Canaveral AS SWPPP was prepared to support the NPDES multi-sector storm water permit, not yet issued.

3.1.13.3 Special Flood Hazard Areas

Special Flood Hazard Areas are defined as areas with a 1 percent or greater chance of equaling or exceeding an established flood level in any given year, or 100-year floodplains. On Cape Canaveral AS, the 100-year floodplain extends approximately 2 meters (7 feet) above msl on the ocean side, and over 1 meter (approximately 4 feet) above msl in the vicinity of the Banana River (U.S. Air Force, 1997). EO 11988, *Floodplain Management*, directs Federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with occupancy and modification of floodplains. In addition, the Air

Force requires a Finding of No Practicable Alternative before taking any action in a floodplain. Areas proposed for LTF activities are not located within a designated 100-year floodplain (National Aeronautics and Space Administration, 1992). However, because average surface elevations are low (approximately 3 meters [10 feet] above msl), the LTF areas may be subject to flooding from storm surge tides.

3.1.13.4 Water Quality

Groundwater in the Floridan Aquifer, beneath Cape Canaveral AS, is highly mineralized due to saline intrusion from the surrounding saltwater bodies (U.S. Air Force, 1997).

Surface water quality near Cape Canaveral AS and KSC is monitored at 11 long-term monitoring stations that are maintained by NASA. The FDEP has classified water quality in the Middle East Coast Basin as "poor to good" based on the physical and chemical characteristics of the water, as well as whether they meet their designated use under FAC 17-3. The upper reaches of the Banana River adjacent to Cape Canaveral AS and the lower reaches of Mosquito Lagoon have generally good water quality due to lack of urban and industrial development in the area. However, recent studies by NASA indicate certain parameters (i.e., primarily phenols and silver) consistently exceed state water quality criteria, with hydrogen ion concentration (pH), iron, and aluminum occasionally exceeding criteria. Nutrients and metals, when detected, have generally been below the Class II standards. Areas of poor water quality exist along the western portions of the Indian River, near the City of Titusville, and in Newfound Harbor in southern Merritt Island. Water quality impacts to surface waters in these areas are influenced primarily by effluent discharges from WWTPs and urban runoff and discharge of wastewater effluent. Discharges to the nearby Banana and Indian rivers is not permitted (U.S. Air Force, 1997).

3.1.14 CAPE CANAVERAL AS ENVIRONMENTAL JUSTICE

3.1.14.1 Background

An environmental justice analysis is included in this document to comply with the intent of EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, and Army guidance. The objectives of the EO include development of Federal agency implementation strategies and identification of disproportionately adverse human health or environmental effects on low-income and minority populations potentially impacted from proposed Federal actions. Accompanying EO 12898 was a Presidential Transmittal Memorandum that referenced existing Federal statutes and regulations to be used in conjunction with EO 12898. One of the Federal statutes referenced was NEPA. Specifically, the memorandum indicates that, "Each Federal agency shall analyze the environmental effects, including human health, economic and social effects, of Federal actions, including effects on minority communities and low-income communities, when such analysis is required by the NEPA 42 U.S.C. section 4321 et. seq."

3.1.14.2 Methodology

Most of the environmental effects from the LTF program at Cape Canaveral AS are anticipated to occur in Brevard County, which is the ROI for the environmental justice analysis. In developing statistics for the 1990 Census of Population and Housing, the U.S. Department of Commerce, Bureau of Census, identified small subdivisions used to group statistical census data. In metropolitan areas, these subdivisions are known as census tracts.

Tables for the 1990 Census of Population and Housing were used to extract data on low-income and minority populations in census tracts in Brevard County. The census reports both on minority and poverty status. Minority populations included in the census are identified as Black; American Indian, Eskimo, or Aleut; Asian or Pacific Islander; Hispanic; or other. Poverty status (used in this EA to define low-income status) is reported as the number of families with income below poverty level ($12,764 for a family of four in 1989, as reported in the 1990 Census of Population and Housing).

A census tract is considered disproportionate under either of these two conditions: (1) the percentage of persons in low-income or minority populations in the census tracts exceeds the percentage in Brevard County, the region of comparison, or (2) the percentage of low-income or minority populations in the census tracts exceeds 50 percent. Data for each census tract were compared to data for the regional political jurisdiction surrounding the tract. For this analysis, the region of comparison was defined as Brevard County. Therefore, Brevard County was used as the ROI for the environmental justice analysis. Based upon the 1990 Census of Population and Housing, Brevard County had a population of 398,978. Of that total, 35,815 persons, or 9.13 percent, were low-income, and 49,861 persons, or 12.45 percent, were minority.

Brevard County is subdivided into 89 census tracts, of which 40 have a disproportionate percentage of low-income or minority populations (or both). These census tracts have been determined to have disproportionate low-income and/or minority populations, and therefore may be subject to environmental justice impacts.

3.2 KENNEDY SPACE CENTER

The following sections discuss the affected environment or baseline conditions at KSC. This discussion includes the locations proposed for use by the LTF program as well as adjacent areas that have the potential to be impacted by program activities.

3.2.1 KSC AIR QUALITY

A general overview of the air quality resource as addressed in this EA is presented in section 3.1.1. Applicable Federal and state regulations are presented in appendix C.

3.2.1.1 Meteorology

The climate at KSC is similar to that described in 3.1.1.2 for Cape Canaveral AS. In general, the climate at KSC is characterized by long, hot summers and mild winters. Winds are generally from the north and west during the winter months and reversed during the summer and fall. Average mixing heights range from a low of approximately 700 meters (2,300 feet) to a high of approximately 1,400 meters (4,600 feet). Average annual rainfall is approximately 120 centimeters (48 inches) and the chance of hurricane force winds is approximately 5 percent annually.

3.2.1.2 Regional Air Quality

Brevard County and neighboring counties are all classified as being in attainment for the NAAQS and state AAQS. There are no PSD Class I areas in the vicinity of KSC, and it should be analyzed as a PSD Class II area.

3.2.1.3 Air Emissions Sources

Air emissions sources at KSC are similar to those presented in section 3.1.1.3 for Cape Canaveral AS. Emissions at KSC are subject to the KSC Title V Air Permit.

3.2.2 KSC AIRSPACE

A general description of the airspace resource is provided in section 3.1.2.

Affected Environment at KSC

The affected environment is defined by the obstruction standards listed on the *Obstruction Evaluation Worksheet* (FAA Form 7460-6). This worksheet identifies criteria to determine if a structure would be an obstruction to navigable airspace. The first set of criteria is used to determine if a structure exceeds the notice criteria requiring a notice to be filed:

- Structure more than 61 meters (200 feet) AGL
- Structure exceeds a slope from an airport—100 to 1 for a distance of 6.1 kilometers (3.8 miles) from a runway of more than 975 meters (3,200 feet) in length

The second set of criteria is used to determine if the structure exceeds the obstruction standards. The potentially applicable criteria for KSC are Part V subparts 77.28(a) and (b), "Application of Airport Imaginary Surfaces, Military Airport and Runway Surfaces." A three-dimensional surface will be generated to determine if any LTF facilities are an obstruction to a military airport.

The nearest airport is the Shuttle Landing Facility, located approximately 5.7 kilometers (3.5 miles) north of the proposed I&T Complex and 4.7 kilometers (2.9 miles) north of the proposed PTC Complex. The Shuttle Landing Facility, elevation 2.7 meters (9 feet msl), will be the origin for the military airfield imaginary surface.

There are several existing obstructions identified on KSC, including the Vehicle Assembly Building (VAB) at 178 meters (583 feet) msl and the two shuttle launch pads at 118 meters (388 feet) AGL and 120 meters (393 feet) AGL. (National Ocean Service, 1999a)

The airspace above KSC is restricted airspace R-2934. R-2934 is managed by the Miami Air Route Traffic Control Center. Altitude is from surface to unlimited, and time of use is intermittent by NOTAM, normally 24 hours in advance. R-2934 is included in the KSC Federal Aviation Regulation 91.143 Space Operations Area that operates on an intermittent basis by NOTAM, from surface to unlimited. (National Ocean Service, 1999a)

3.2.3 KSC BIOLOGICAL RESOURCES

A definition of biological resources is presented in section 3.1.3. The ROI for biological resources includes areas that may be affected by project activities, such as construction, noise, and human presence.

3.2.3.1 Vegetation

KSC is located in a transition zone between a warm temperate area to the north and a subtropical area to the south with high biological diversity. More than 1,000 species of plants have been identified on KSC. Terrestrial vegetation on KSC is composed of 11 main vegetation communities. (Kennedy Space Center, 1997)

The sites proposed for use are covered predominantly by exotic shrubs, cattail and graminoid marsh, broad-leaved woodlands, and scrub and slash pine.

Miscellaneous disturbed vegetation habitat consists of vegetation altered by human disturbance. This habitat is dominated by weedy and exotic shrubs and vegetation such

as Brazilian pepper and Australian pine. (Kennedy Space Center, 1997; Myers and Ewell, 1992)

Cattail and graminoid (relating to grasses) marsh habitat includes areas designated as cattail marsh, graminoid marsh, and cabbage palm savanna. These occur as isolated wetlands interspersed among scrub and slash pine flatwoods. *Typha dominengis* and *T. latifolia* dominate cattail marshes. Cabbage palm savanna has an open canopy of cabbage palm (and an understory of sand cordgrass). Graminoid marshes consist of species such as beard grass, Curtiss reedgrass (*Calamovilfa curtissii*) (under review for Federal listing), sawgrass, flag marshes, and bloodroot. (Kennedy Space Center, 1997)

Four major broad-leaved woodlands are located on KSC. The oak-cabbage palm hammock is composed of live oak and cabbage palm. The redbay–live oak–laurel oak hammock canopy is composed of red bay, live oak, and laurel oak. The understory is dominated by saw palmetto. Hardwood swamps are dominated by deciduous species such as red maple and persimmon. Evergreens such as laurel oak and cabbage palm are also present. The Carolina willow, red maple, and wax myrtle dominate Willow swamps. Aquatic plants such as arrowhead compose the understory. (Kennedy Space Center, 1997)

Scrub and pine flatwoods have similar mixed oak/palmetto shrub layers, but pine flatwoods have an open overstory of slash pine. Scrub oaks are also present. A few small stands of sand pine and hickory scrub also exist on KSC. (Kennedy Space Center, 1997)

3.2.3.2 Wildlife

More than 115 species of fish, 65 species of amphibians and reptiles, 315 species of birds, and 25 species of mammals have been identified on KSC. Up to 25 species of fish are found in wetlands and impounded wetlands on KSC. Sailfin molly, eastern mosquito fish, and sheepshead minnow are examples of resident KSC fish. Transient fish species include striped mullet, ladyfish, and common snook. (Kennedy Space Center, 1997; National Aeronautics and Space Administration, 1997a)

Cattail and graminoid marsh on KSC provides habitat for a variety of amphibians such as the southern toad, southern leopard frog, Florida and striped mud turtles, eastern mud snake, and rough green snake. (National Aeronautics and Space Administration, 1997a)

KSC provides breeding habitat for nearly 90 species of birds. Areas of wetlands and man-made mosquito control impoundments provide ideal feeding, roosting, and nesting habitat for a variety of birds. The white ibis, common moorhen, mourning dove, common nighthawk, and northern cardinal are examples of breeding birds that may be found in the ROI. Many of the wetlands are also managed to provide wintering habitat for waterfowl. (National Aeronautics and Space Administration, 1997a)

Common mammals observed on KSC include opossum, raccoon, marsh rabbit, wild pig, skunk, and Florida mouse. KSC has several wildlife management practices in operation to protect and enhance the habitat and wildlife present on the installation. One of these controls the population of the raccoon and wild pig, two species of pest animals. These animals compete with endemic predators, uproot vegetation, and raid sea turtle nests.

3.2.3.3 Threatened and Endangered Species

State endangered and threatened plants are located in various habitats on KSC and are listed in table 3.2.3-1. Many of these plants are restricted to hammocks and hardwood swamps. Protected areas within KSC and adjacent Federal properties are important remaining habitat for native plants. Habitat destruction is the major threat to the continued existence of most of the listed plants. Other threats include sensitivity to fire, decline if fire is excluded, collection, rooting by feral hogs, and invasion by exotic plants. (Kennedy Space Center, 1997)

Federally threatened and endangered wildlife species common to KSC and Cape Canaveral AS are described in section 3.1.3.3. Additional information relevant to their appearance on KSC is provided below. The eastern indigo snake is common on KSC during all four seasons. The Atlantic salt marsh snake (*Nerodia clarkii taeniata*), a Federal and state threatened water snake, has recently only been found on the coast of central Florida. The southern limit has not been determined for this species. The loggerhead sea turtle nests on KSC beaches between April and September. Approximately 98 percent of all marine turtle nests on KSC are loggerhead nests. Predation by raccoons and feral pigs is a continuing threat to this species. The Federal and state endangered green turtle also nests on KSC. Merritt Island National Wildlife Refuge (MINWR) is the extreme northern boundary of the Federal and state endangered Kemp's Ridley turtle habitat. Efforts are being made to protect potential Ridley turtle habitat within the refuge. (Kennedy Space Center, 1997)

All open water on KSC with a depth of more than 1 meter (3 feet) is potential habitat for the Federal and state endangered West Indian manatee. Large groups of manatees are found where deep basins border extensive seagrass beds. Over 300 manatees have been observed during spring in recent years within the KSC boundaries of the Banana River. Recent studies indicate that the summer population of the Federal and state threatened American alligator reaches 5,000 at MINWR. Problem alligators are removed to more isolated areas. (Kennedy Space Center, 1997; National Aeronautics and Space Administration, 1997a)

The largest population of Florida scrub jays, a Federal and state threatened species, occurs on KSC. This population plus two others compose almost 80 percent of the entire population. The primary habitat includes well-drained scrub and slash pine. (Kennedy Space Center, 1997; National Aeronautics and Space Administration, 1997a)

Table 3.2.3-1: Species with Federal or State Status Potentially Occurring at Kennedy Space Center

Scientific Name	Common Name	Status State	Status Federal
Plants			
Avicennia germinans	Black mangrove	SP	–
Calamovilfa curtissii	Curtiss reedgrass	E	–
Cereus gracilis	Prickly-apple	T	–
Ophioglossum palmatum	Adder's tongue fern	E	–
Rhizophora mangle	Red mangrove	SP	–
Tournefortia gnaphalodes	Sea lavender	T	–
Zamia umbrosa	East coast coontie	T	–
Reptiles and Amphibians			
Alligator mississippiensis	American alligator	SSC	T (S/A)
Caretta caretta	Atlantic loggerhead turtle	T	T
Chelonia mydas	Atlantic green turtle	E	E
Dermochelys coriacea	Leatherback turtle	E	E
Drymarchon corais couperi	Eastern indigo snake	T	T
Eretmochelys imbricata	Atlantic hawksbill turtle	E	E
Lepidochelys kempi	Kemp's Ridley turtle	E	E
Nerodia clarkii taeniata	Atlantic salt water marsh snake	T	T
Birds			
Aphelocoma coerulescens	Florida scrub jay	T	T
Falco peregrinus tundrius(1)	Arctic peregrine falcon	E	–
Haliaeetus leucocephalus	Bald eagle	T	T
Mycteria americana	Wood stork	E	E
Mammals			
Trichechus manatus	West Indian manatee	E	E
Ursus americanus floridanus	Florida black bear	T	C

Source: Kennedy Space Center, 1997; National Aeronautics and Space Administration, 1997a; U.S. Department of the Interior, 1998.

(1) Recently delisted, but will be monitored for the next decade
– Not listed
SSC Species of special concern
SP Special Concern
E Endangered
T Threatened
C Candidate
(S/A) Listed by similarity of appearance to a listed species

New wood stork colonies have been established on mangrove islands that were not as extensively damaged by freezes in 1983 and 1985. Bald eagles arrive at KSC during late summer and remain until late spring. There are currently 8 to 9 breeding pairs of bald eagles on KSC; however, the goal is at least 15 pairs. The eagle's nest near the proposed PTC Complex was active in 1998 and 1999 (Kennedy Space Center, 1999). The recently Federally delisted and state endangered arctic peregrine falcon (*Falco peregrinus tundrius)* is a crow-sized raptor that winters on KSC. (Kennedy Space Center, 1997; National Aeronautics and Space Administration, 1997a)

3.2.3.4 Environmentally Sensitive Habitats

Environmentally sensitive habitats on KSC include wetlands, listed species critical habitats, and MINWR.

Wetlands

There are approximately 15,000 hectares (38,500 acres) of wetlands on KSC. Seventy percent of the species on KSC listed as threatened or endangered by the USFWS depend heavily on wetlands. (Kennedy Space Center, 1997)

The sites proposed for use are located within wetlands areas (table 3.2.3-2). The proposed PTC Complex site includes approximately 5 hectares (12 acres) of wetlands at the construction site and 4 hectares (10 acres) at the laydown area. The proposed I&T Complex site includes approximately 1 hectare (3 acres) of wetlands. Additional wetlands exist beyond the upland area along Schwartz Road West.

Critical Habitats

Manatee critical habitat is discussed in section 3.1.3.4.

Merritt Island National Wildlife Refuge

MINWR, located just east of Titusville, Florida, shares KSC's northern boundary. In the early 1960s, NASA began acquiring the area to establish KSC. The refuge was established in 1963 when NASA turned over portions of the KSC not critical to space program operations to the USFWS. A wide variety of habitats exist on the refuge, ranging from freshwater impoundments and large saltwater estuaries to brackish marshes. The refuge provides habitat for more than 330 species of birds, 31 species of mammals, 117 fish species, and 65 species of reptiles and amphibians. Open water provides wintering habitat for migratory waterfowl and a year-round habitat for a variety of marsh and shore birds. The refuge supports 21 wildlife species listed as threatened or endangered by the Federal or state government. A marsh restoration project was begun in 1993 that will reconnect many of the impoundments to the Indian or Banana River, creating even greater wildlife diversity. Approximately 1 percent of the refuge is managed as active citrus groves. (Merritt Island National Wildlife Refuge, no date)

Table 3.2.3-2: Kennedy Space Center Alternative Wetlands and Land Cover

Category	Area in hectares (acres)
Proposed PTC Complex Wetlands/Laydown Area	
Palustrine Emergent Persistent Permanently Flooded (PEM1Fh, PEM1C, and PEM1Fx)	0.62 (1.54)/0.58 (1.43)
Palustrine Scrub/Shrub Broad-leaved Evergreen Temporarily Flooded (PSS3A and PSS3Ah)	3.08 (7.61)/3.46 (8.54)
Palustrine Unconsolidated Bottom Permanently Flooded Excavated (PUBHx)	1.10 (2.72)/NA
Riverine Lower Perennial Aquatic Bed Floating-leaved Vascular Excavated (R2AB4Hx)	0.09 (0.22)/NA
Total Wetlands	**4.89 (12.09)/4.04 (9.97)**
Proposed I&T Complex Wetlands	
Palustrine Emergent Persistent Seasonally Flooded (PEM1C)	1.08 (2.68)
Total Wetlands	**1.08 (2.68)**
Proposed PTC Complex Land Cover/Laydown Area	
Cabbage Palm/Cedar Hammock	0.66 (1.64)/3.59 (8.82)
Disturbed Shrubs/Exotics	0.30 (0.80)/NA
Marsh/Swale	0.36 (0.88)/0.40 (0.99)
Oak Hammock/Forest	1.25 (3.10)/0.06 (0.16)
Open Water	0.97 (2.39)/NA
Wetland Forest	0.55 (1.37)/NA
Urban/Developed	1.96 (4.85)/NA
Total Area	**6.05 (15.03)/4.06 (9.97)**
Proposed I&T Complex Land Cover	
Citrus/Pine Plantation	5.17 (12.77)
Disturbed Shrubs/Exotics	1.14 (2.83)
Oak Hammock/Forest	0.07 (0.18)
Wetland Forest	3.88 (9.59)
Total Area	**10.26 (25.37)**

NA – Not Applicable

3.2.4 KSC CULTURAL RESOURCES

For a definition of cultural resources and the cultural resources ROI, as well as a description of the types of laws and regulations that govern these resources, see section 3.1.4.

3.2.4.1 Prehistoric and Historic Archaeological Resources

The prehistoric and historic archaeological complexion of the KSC area is largely as described for Cape Canaveral AS (see section 3.1.4.1). Also similar to Cape Canaveral, the legacy left by early Indian tribes in the areas within the KSC boundary consists of shell middens, burial mounds, and prehistoric artifact scatters. The most impressive of the shell middens is Ross Hammock, which is located on the west shore of Mosquito Lagoon, south of the community of Oak Hill (in the north KSC area).

The earliest archaeological surveys of the KSC area were conducted by LeBaron (1884), a U.S. engineer who traveled through the region from 1877 to 1878, and A.E. Douglas (studies between 1882-1890), who located some of the first mound sites. In 1895-1896, Moore (1922) excavated a number of mounds along the Indian River; however, after that time, archaeological studies of the area were not conducted for nearly 40 years. In 1931, Stirling (1935) of Harvard's Peabody Museum investigated 11 sites in the Cape Canaveral vicinity and in 1951, a landmark synthesis of Indian River archaeology was published by Rouse (1951). Between 1956 and 1963, Ripley Bullen's work at Ross Hammock, Castle Windy, and Green Mound contributed to a better understanding of the sequence of aboriginal cultures in the region. In 1967, Long located and described nearly 28 mound and midden sites. Between 1973 and 1976, Smith and Ehrenhard expanded the list of known sites around KSC refuge lands (National Aeronautics and Space Administration, 1997a) (see also section 3.1.4.1).

Systematic surveys of areas in the MINWR that were projected to be impacted by construction and development (Miller [1980 and 1981] and Griffin [1978]) found no significant cultural resources other than four historic sites: Sugar Mill Ruins, Fort Ann, the Old Haulover Canal, and the Dummett Homestead. These sites were examined in detail and, in each location, structural or earthwork remains were encountered. Miller and Griffin's study areas included Mosquito Lagoon north to the Shipyard Canal near Turtle Mound, all of Merritt Island as far south as the KSC Barge Canal, and all of Cape Canaveral for the same distance south (National Aeronautics and Space Administration, 1997a).

In 1981, Miller assessed two additional locations on refuge lands. One area covered 2 hectares (6 acres), where Peacock Pocket Road marks the east boundary and SR-402 borders on the north, and the other was located on the south edge of SR-402 some 701 meters (2,300 feet) west of Peacock Pocket Road. No significant archaeological sites were found at either of the two locations. In 1982, Miller conducted a survey of the United Space Booster Facility tract on Merritt Island. No significant cultural resources were found. Similarly, no significant cultural resources were found at the Space Shuttle Solid Rocket Booster Facility site in a survey conducted by Smith in 1974.

In the early 1990s, NASA initiated studies to determine Zones of Archaeological Potential, in order to protect sensitive (or unrecorded) sites from the increase in construction activities at KSC. The surveys were conducted by Archaeological Consultants between 1990 and 1992 (National Aeronautics and Space Administration, 1997a) and established

three Zones of Archaeological Potential: areas of low, medium, or high archaeological potential. Areas outside the three Zones of Archaeological Potential, as well as areas designated as Zone of Archaeological Potential 1, require no further archaeological study. The Florida SHPO has concurred with this approach (Busacca, 1997).

There are no recorded sites within the areas proposed for the LTF PTC Complex, the LTF I&T Complex, or the LTF 549-meter (1,800-foot) ESQDs. The closest recorded site is Site #8BR150 (a National Register-eligible prehistoric mound), which lies approximately 914 meters (3,000 feet) southeast of Building L5-683 and within the Laser Safety Zone. In addition, the locations for construction of the LTF fall either outside the three Zones of Archaeological Potential or within Zone of Archaeological Potential 1 (low potential); therefore, no additional archaeological studies are required (Busacca, 1997).

3.2.4.2 Historic Buildings and Structures

Historic settlement of the KSC area is also similar to that described for Cape Canaveral AS (see section 3.1.4.2). After Florida was ceded to the United States in 1821, it became a territory, and shortly thereafter, commerce and settlement began along the coastal areas. Limited agriculture and fishing industries developed, and permanent homesites and settlements were established. Citrus was an important early crop, and the famous Dummett Grove was started in 1840.

Titusville became the county seat in 1880. Brevard County's present boundaries were drawn in 1905; they have remained unchanged since that time (National Aeronautics and Space Administration, 1997a).

The extension of Henry Flagler's Florida East Coast Railroad drastically reduced the area's dependence on waterway transport systems and opened the area to further agriculture and fishing industry expansion, but the area continued to be primarily rural in economic pursuits and temperament until the coming of the Space Program in the 1950s.

There are two buildings (Buildings L5-683 and L5-734) located within the ROI. Building L5-683 is a moderate-sized concrete block structure (approximately 792 square meters [8,529 square feet]) which currently houses stray cats that are trapped on the installation; the building was originally constructed as a laboratory in 1965. Building L5-734 is a small storage building (77 square meters [825 square feet]) that supports Building L5-683.

3.2.4.3 Native Populations/Traditional Resources

At the time of Spanish contact (1513), the KSC area was populated by the Timucuan Indians, an earlier tribe known as the Surruques having disappeared (the Spaniards referred to Mosquito Lagoon as the "Lake of Surruque"). Within 200 years of the arrival of the Europeans, the Timucuan had also disappeared largely as a result of introduced European diseases and slavery.

Today, there are no known direct descendants of the Surruque Tribe remaining. The Seminole, who are direct descendants of the Timucuan, are recognized as the appropriate Native American culture for consultation during the treatment of both Timucuan or Surruque remains (Busacca, 1997).

Significant traditional resources sites are subject to the same regulations and are afforded the same protection as other types of historic properties. Traditional sites associated with the Timucuan or Surruque could include archaeological and burial sites, mounds, ceremonial areas, hillocks, water sources, plant habitat or gathering areas, or any other natural area important to this culture for religious or heritage reasons. By their nature, traditional resources sites often overlap with (or are components of) archaeological sites. As such, some of the National Register-listed or -eligible sites identified at KSC could also be considered traditional resources sites or contain traditional resources elements.

No traditional cultural properties have been identified within the ROI. The only archaeological site in the vicinity of the LTF ROI is Site #8BR150, a prehistoric mound located approximately 914 meters (3,000 feet) southeast of Building L5-683. Based on the site type, this site could also be considered a traditional cultural property.

3.2.5 KSC GEOLOGY AND SOILS

This section provides an overview of the physiography and soils of KSC. KSC is located near Cape Canaveral AS and, as such, shares similar geologic and soil characteristics. Refer to section 3.1.5 for a discussion of underlying geology and geologic hazards associated with KSC and the surrounding area. In general, the ROI is defined by the regional geologic setting and the areas in the immediate vicinity of the proposed PTC Complex and I&T Complex that could be affected by construction and operation activities.

3.2.5.1 Physiography

KSC lies on a barrier island composed of relict beach ridges formed by wind and wave action. The topography of KSC is marked by a series of swales and ridges (representing relict dunes), ranging in height from sea level to 3 meters (10 feet) above msl in the inland areas and 6 meters (20 feet) above msl on the recent dunes. Land surface elevations at KSC average approximately 3 meters (10 feet) above msl. The higher naturally occurring elevations occur along the eastern portion of KSC, with a gentle slope to lower elevations toward the marshlands along the Indian River. In general, surface elevations at the proposed PTC Complex and I&T Complex range from approximately 1.5 to 3 meters (5 to 10 feet) above msl (Kennedy Space Center, 1998b).

3.2.5.2 Geology

See section 3.1.5.2.

3.2.5.3 Soils

The soil survey of Brevard and Volusia counties identified five general soil associations at KSC. These associations include the Myakka-EAU Gallie-Immokalee, Copeland-Wabasso, Paola-Pomello-Astatula, Canaveral-Palm Beach-Welaka, and the Salt Water Marsh/Swamp associations. The Myakka-EAU Gallie-Immokalee and Copeland-Wabasso associations are nearly level, very poorly drained to poorly drained, and sandy to a depth of approximately 12 meters (40 feet). The Paola-Pomello-Astatula and Canaveral-Palm Beach-Welaka associations are nearly level to strongly sloping, excessively to moderately drained soils, and sandy throughout the profile. The Salt Water Marsh/Swamp association is nearly level, very poorly drained, and saline to brackish soils of variable textures (National Aeronautics and Space Administration, 1997a).

3.2.5.4 Geologic Hazards

See section 3.1.5.4.

3.2.6 KSC HAZARDOUS MATERIALS AND HAZARDOUS WASTE MANAGEMENT

For a general discussion of the regulations governing hazardous materials and hazardous waste management and a discussion of the ROI, see section 3.1.6.

3.2.6.1 Hazardous Materials Management

Numerous types of hazardous materials are used annually to support the various missions and general maintenance operations at KSC. These materials include common building paints, industrial solvents, acids, and hazardous fuels. Hazardous materials are also used by on-station contractors supporting station construction and operations.

Hazardous materials management is the responsibility of each individual or organization. Individual contractors at KSC may obtain hazardous materials through their own organizations, local purchases, or other outside channels. Transportation of hazardous materials is regulated by the U.S. DOT regulations within 49 CFR.

Hazardous fuels are controlled by the JPC for the 45 SW. The JPC provides for the purchase, transport, temporary storage, and loading of hazardous fuels and oxidizers. Because of the limited storage capacity on station, only limited quantities of hypergolic fuels are stored onsite at any time. Spills of hazardous materials are covered under 45 SW Operational Plan 32-3, *Hazardous Materials Response Plan*. KSC has a hazardous materials response team.

3.2.6.2 Hazardous Waste Management

Hazardous waste management at KSC is regulated by 40 CFR 260-280 and FAC 62-730. These regulations are implemented through KSC Handbook 8800.7A, *Hazardous Waste*

Management, and KSC Management Instruction 8800.7, *Management of Hazardous Waste for Compliance Handling, Treatment, and Disposal-Reclamation.*

NASA, as the owner of the facilities at KSC, is considered the generator of hazardous wastes. All hazardous waste generated is labeled with the U.S. EPA identification number for KSC and is transported, treated, and disposed of under this number. All individuals or organizations at KSC are responsible for administering all applicable regulations and plans regarding hazardous waste, and for complying with applicable regulations regarding the temporary accumulation of waste at the process site. KSC's Waste Management Authority is responsible for maintaining onsite treatment, storage, and disposal facilities and for managing offsite service contracts for the treatment and disposal of hazardous wastes that cannot be safely treated or disposed of at KSC facilities. The main facilities operating under this permit are the Hazardous Waste Storage Facility (K7-165) in the LC-39 area, which handles liquid hazardous waste, and Facility M7-1361 in the industrial Area, which handles solid hazardous wastes. Used petroleum materials may be sent to the Hydrocarbon Recovery Facility (Complex 34) on Cape Canaveral AS or sold through DRMO. Propellant wastes are disposed through explosive ordnance disposal, a RCRA-permitted hazardous waste management activity located at Cape Canaveral AS. Hypergolic-contaminated effluents that exhibit hazardous characteristics or are listed as hazardous wastes are transferred to an offsite treatment, storage, and disposal facility (National Aeronautics and Space Administration, 1997a; U.S. Department of the Air Force and National Aeronautics and Space Administration, 1993)

Individual contractors and organizations maintain hazardous waste satellite accumulation points and 90-day hazardous waste accumulation areas in accordance with 40 CFR 262.34 and 40 CFR 261.33(e). A maximum of 208 liters (55 gallons) per waste stream of hazardous waste can be accumulated at a satellite accumulation point. There is no limit to the volume of waste that can be stored, but wastes must be taken to the permitted 1-year facility or disposed of offsite within 90 days. Since KSC regularly ships waste offsite as a truck or tanker load is accumulated, storage capacity is not a limiting factor. (Personal communication with Ned Voska, 1998) KSC reported the generation of 779 metric tons (859 tons) of hazardous waste in 1993. These wastes included inorganic liquids, organic solids and sludges, inorganic solids, and a small amount of organic gases and lab packs. (Kennedy Space Center, Environmental Program Office, 1997)

3.2.6.3 Pollution Prevention

The NASA/KSC Environmental Program Office outlines a policy for pollution prevention to implement an integrated approach to minimize environmental contamination and pollution. The program's goals are to incorporate pollution prevention considerations in all agency decisions and develop visibility for implementing pollution prevention. Specific objectives involve life-cycle cost and pollution prevention considerations in the Program and Project Management review cycle, environmental partnerships to share technical resources, expand environmental monitoring and awareness, reduction or elimination of the use of hazardous materials and processes that produce hazardous wastes, and new technologies that use environmentally benign substance and processes. (Kennedy Space Center, Environmental Program Office, 1997)

3.2.6.4 Remediation

The Remediation Program Management section of KSC's Environmental Program Office administers a Corrective Action Management Plan. (Kennedy Space Center, Environmental Program Office, 1997) There is no known contamination at either of the sites proposed for LTF facilities.

3.2.6.5 Storage Tanks

For a general discussion of the Federal and state regulations governing storage tanks, see section 3.1.6.5.

There are major concentrations of USTs at KSC in the LC-39 Area, VAB Area, and Industrial Area. In addition, there are NASA tanks at Cape Canaveral. There are no tanks in the areas proposed for LTF facilities. (Kennedy Space Center, Environmental Program Office, 1997)

3.2.6.6 Asbestos

For a general discussion of asbestos regulation, see section 3.1.6.6.

The existing buildings and facilities proposed for LTF may contain asbestos. EG&G Environmental Health has completed a KSC-wide asbestos survey, and the data is compiled on the KSC Environmental Health Asbestos Survey Data home page. The KSC Environmental Checklist advises that if a project will disrupt construction materials, an asbestos survey should be completed if one has not been done already. EG&G Environmental Health provides assistance with surveys and notifications.

3.2.6.7 Polychlorinated Biphenyls

For a general discussion of PCBs and their regulation, see section 3.1.6.7.

PCB-contaminated equipment could occur at the existing facilities proposed for modification for the LTF. PCB contamination in paints or other equipment must be verified or tested before proceeding with facility modifications. KSC currently has a PCB remediation program.

3.2.6.8 Lead-based Paint

For a general discussion of lead and its regulation, see section 3.1.6.8.

The occurrence of lead-based paints in the existing buildings proposed for the LTF is unlikely (Voska, 1999). Before building demolition or modifications, the construction contractor may be required to conduct a lead-based paint survey.

3.2.7 KSC HEALTH AND SAFETY

For a definition of health and safety resources, definition of the ROI, and a description of the types of laws and regulations that govern these resources, see section 3.1.7.

3.2.7.1 Regional Safety

The City of Merritt Island, Cape Canaveral AS, KSC, and the Joint Base Operations Contractor at KSC have entered into a mutual aid agreement in the event of an on station emergency. Each organization may request equipment and manpower in the event of a fire or other emergency.

3.2.7.2 On-station Safety

Construction and Support Activities

Health and Safety for construction and support activities is regulated under NASA and KSC instructions. Activities at KSC follow the guidelines set forth by the NASA Safety Program. Primary occupational health and safety requirements for NASA are specified in NASA Handbook NHB 2710.1, "Safety and Health Handbook–Occupational Safety and Health Programs." Onsite safety is the responsibility of all NASA organizations, employees, contractors, and visitors. These instructions provide for health and safety programs that are at least as effective as OSHA programs. Contractor health and safety programs must meet at least the minimums required by OSHA. The KSC Independent Assessment and Audit Office evaluates contractor processes and performance to ensure compliance with KSC instructions and OSHA regulations. Safety responsibilities for NASA contracts and contractor operations will be coordinated among the program, safety, and contracting offices by ensuring that all appropriate safety procedures remain consistent with all activities, schedules, proposed changes, and Statements of Work.

Preparation and Launch of Space Transport Vehicles

The preparation and launch of space transport vehicles is the major activity of NASA KSC. The Safety and Mission Assurance Directorate ensures the safety, reliability, maintainability, and quality of every mission launched from KSC. It also ensures the safety of its employees and other personnel on KSC through program monthly reports, audits, and inspections. Customers consult with KSC Safety and Mission Assurance Directorate to plan and implement operations requirements safely and effectively.

The Safety and Mission Assurance Directorate also reviews and investigates any mishaps and accidents that may occur at KSC. The Base Operations Contractor provides an emergency response force. Additionally, coordination support agreements between KSC and local municipalities provide for reciprocal support in the event of an emergency or disaster. Fire protection at KSC includes a comprehensive program of fire protection engineering, fire prevention, fire suppression, and emergency hazards of operations at KSC are provided onsite.

3.2.8 KSC LAND USE AND AESTHETICS

This section describes the existing environment in terms of land use and aesthetics for the areas on and surrounding KSC. Topics addressed are regional land use, KSC land use, coastal zone management, and aesthetics. The ROI includes the KSC boundaries and potentially affected adjacent lands.

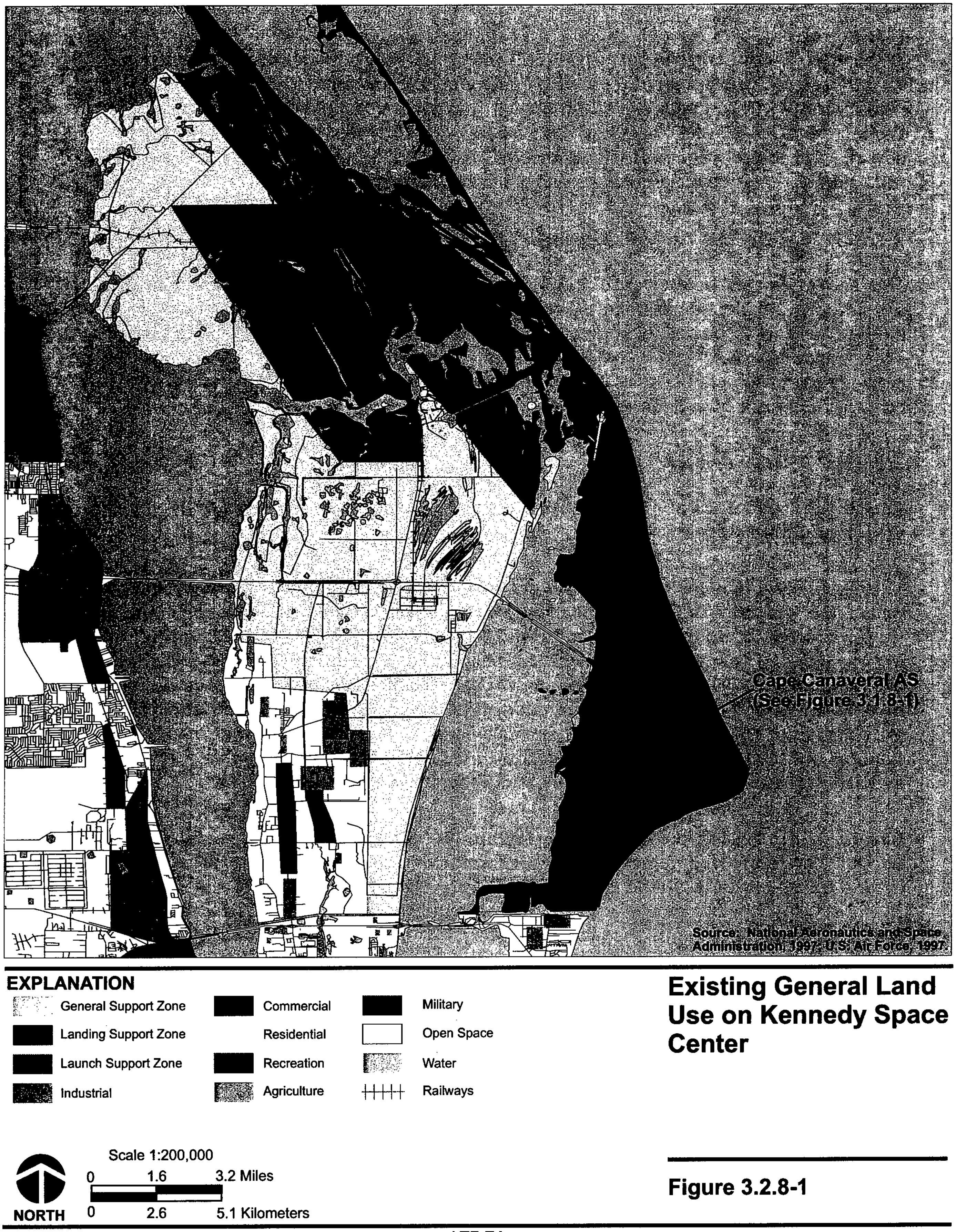
3.2.8.1 Regional Land Use

Brevard and Volusia counties, the cities of Oak Hill, Titusville, and Cape Canaveral, and the East Central Florida Regional Planning Council are the local planning authorities for incorporated and unincorporated areas around KSC. Land uses designated by Brevard County for Merritt Island include residential, industrial, public facilities, agricultural, recreation, and conservation. Areas to the north in Volusia County, which borders KSC, consist of open and recreational areas associated with the Canaveral National Seashore, MINWR, and urban uses within the City of Oak Hill. According to the KSC *Facilities Master Plan*, KSC designates its own land use and zoning regulations. No external zoning regulations impact KSC land use because it is Federally owned.

3.2.8.2 On-base Land Use

KSC encompasses an area of 56,450 hectares (139,490 acres) and is located in the northeastern section of Brevard County and just into the southern end of Volusia County. NASA maintains control over 2,406 hectares (5,945 acres) of KSC. The rest is divided among the National Park Service with 2,693 hectares (6,655 acres) for the Canaveral National Seashore, and USFWS with 30,734 hectares (75,945 acres) for the MINWR and 20,617 hectares (50,945 acres) for the Canaveral National Seashore. MINWR encompasses most of KSC with the Canaveral National Seashore located in the northern portion of the center. The NASA operational area is in the southern half of KSC. (National Aeronautics and Space Administration, 1997a)

KSC is divided into three general zones: the Landing Support Zone, the Launch Support Zone, and the General Support Zone (figure 3.2.8-1). The Launch Support Zone extends from the shuttle launch pads to the Launch Impact Limit Line and into the Atlantic Ocean. Included in this zone are the launch pads, launch support facilities, and instrumentation facilities. The Landing Support Zone is adjacent to the Launch Impact Limit Line and consists of structures required in direct support of shuttle landings. The General Support Zone extends from the Launch Support Zone to the KSC boundary and contains administrative, logistical, and industrial support facilities. Within these general zones are some specific area planning zones that have been established for the VAB and the Industrial Area. Another special use zone is the citrus grove zone, which allows groves, predating government purchase of KSC, to be cultivated and maintained. These citrus grove zones are located throughout KSC and are allowed to remain without expansion until they fail, and then they will revert to a natural state. (National Aeronautics and Space Administration, 1992)



Existing General Land Use on Kennedy Space Center

Figure 3.2.8-1

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Within the NASA controlled areas of KSC, the property is broken down into six uses. These uses include the Shuttle Landing Facility (1,038 hectares [2,566 acres]), the Industrial Area (545 hectares [1,346 acres]), the VAB area [281 hectares (694 acres)], Launch Pads 39A/B (157 hectares [388 acres]), the Crawlerway (60 hectares [149 acres]), and the remainder of miscellaneous NASA facilities composed of 325 hectares (802 acres). (National Aeronautics and Space Administration, 1997a)

3.2.8.3 Coastal Zone Management

This section is the same as section 3.1.8.3 for Cape Canaveral AS with the following exceptions. KSC does not have the additional setback of 46 meters (150 feet) for development in a coastal zone, only a setback of 23 meters (75 feet). The other exception is that NASA, not the Air Force, is responsible for making the final coastal zone consistency determinations for its activities within the state, and FDCA reviews the coastal zone consistency determination.

3.2.8.4 Aesthetics

The ROI for aesthetics at KSC includes the general visual environment surrounding the station and the areas visible from off-station areas.

The visual environment in the vicinity of KSC is characterized by the barrier island on which it is located. Topography of the island is generally flat, with elevations ranging from sea level to approximately 6 meters (20 feet) above sea level. KSC is fairly undeveloped. The most visually significant aspect of the natural environment is the gentle coastline and flat island terrain. The landscape is dominated by Florida coastal stand, coastal scrub, and coastal dune vegetation. The area has a low visual sensitivity because the flatness of the area limits any prominent vistas. The most significant man-made features are the launch complexes and the various support facilities within the VAB and industrial areas. (National Aeronautics and Space Administration, 1997a)

Since public access to the center's control area is highly restricted, viewpoints are primarily limited to open areas of KSC such as the Visitor Complex and the press area, to marine traffic on the east and west, to Port Canaveral, Cape Canaveral and Cocoa Beach to the south, Titusville to the west, and to unrestricted areas of MINWR and the Canaveral National Seashore, such as the visitor centers.

3.2.9 KSC NOISE

For a general discussion of noise and the method of measurement used in this EA, see section 3.1.9.

Background Noise Levels off KSC

Most of the region surrounding KSC is open water, with the Atlantic Ocean and Banana River to the east, the Indian River to the west, and the undeveloped land of the MINWR and the Canaveral National Seashore to the north. Immediately south of KSC are portions of Merritt Island and Port Canaveral. This relative isolation reduces the potential for noise to affect adjacent communities. The closest residential areas to KSC are Titusville to the west, and the cities of Cape Canaveral and Cocoa Beach to the south. Expected sound levels in these areas are normally low, with higher levels occurring in industrial areas (Port Canaveral) and along transportation corridors. Residential areas and resorts along the beach would be expected to have low overall noise levels, normally about 45 to 55 dBA. Infrequent aircraft flyovers from Patrick AFB and missile launches from Cape Canaveral AS and KSC would be expected to increase noise levels for short periods of time. The launch of space vehicles from KSC does generate intense, but relatively short-duration, noise levels of low frequencies in the local communities. Noise levels at Port Canaveral would be expected to be typical of an industrial facility reaching levels of 60 to 80 dBA. (U.S. Air Force, 1997)

Background Noise Levels on KSC

Noise generated at KSC by day-to-day operations, space vehicle launches, and orbiter landings can be attributed to six general sources: orbiter reentry sonic booms, launches, aircraft movements, industrial operations, construction, and traffic noise. Measured noise levels at KSC range from 50 dBA in undisturbed areas to over 160 dBA in the vicinity of a Space Shuttle launch. Noise generated at the airfield on KSC are expected to be similar to a small commercial airport. Noise levels in the industrial area can range from a high of 116 dBA in the VAB to 58 dBA in the Headquarters Office. (National Aeronautics and Space Administration, 1997a)

3.2.10 KSC SOCIOECONOMICS

KSC is located in the same region as Cape Canaveral, with the proposed test sites being 17.5 kilometers (11 miles) apart. For the purposes of this EA, therefore, the regional analysis for Cape Canaveral, including population, employment, and income, should be used.

3.2.11 KSC TRANSPORTATION

Roadways—Off-installation Network

Highway transportation routes are shown in figure 3.1.11-1. Road access to KSC is from SR-3 and the Cape Road from the south, SR-405 and Beach Road (SR-406) from the west, and Kennedy Parkway from the north. Roadways servicing KSC are described in table 3.1.11-1. US-1 serves as a major transportation corridor for KSC employees, as do SR-A1A and SR-528. SR-405, which becomes the NASA Causeway as it enters KSC, experiences a large volume of peak-hour traffic, but has capacity to accommodate the daily volume.

Roadways—On-installation Network

All paved roads conform to the American Association of State Highway and Transportation specification H20-S16, establishing load-bearing capacity of 18 metric tons (20 tons) for a tractor truck and a gross single axle weight of 14.5 metric tons (16 tons) or 7.3 metric tons (8 tons) per wheel (National Aeronautics and Space Administration, 1997a). Roadways potentially affected by LTF include Kennedy Parkway South, and Schwartz Road West and Roberts Road, both 2-lane, east-west roads.

Waterways—Off-installation

Port Canaveral is the nearest navigable oceanic connection (figure 3.1.11-1); tonnage and passenger levels are discussed in section 3.1.11. Extending from Canaveral Locks, the 3.7-meter (12-foot) deep, 38.1-meter (125-foot) wide Canaveral Barge Canal proceeds across the Banana River and Merritt Island to the Indian River/Intracoastal Waterway. The Intracoastal Waterway follows the Indian River through Haulover Canal, proceeding north through Mosquito Lagoon. Public navigational access is prohibited north of the NASA Parkway East.

Waterways—On-installation

Approximately 30.5 kilometers (19.3 miles) of maintained Banana River channels provide navigable access from Port Canaveral to KSC docking facilities. These include the 19-kilometer (12-mile) long, 4-meter (12-foot) deep Turning Basin Access Channel (also known as the Banana River Channel), extending from Port Canaveral north to the VAB Barge Terminal Facility. In addition, a spur off this channel accesses the Cape Canaveral AS Solid Rocket Booster Recovery Slip/Hangar AF. The distance from the proposed LTF site to the barge terminal is 8.9 kilometers (5.5 miles).

Railways—Off-installation

Brevard County Railway facilities are described in section 3.1.11.

Railways—On-installation

A Florida East Coast railroad spur accesses KSC, spanning the Indian River/Intracoastal Waterway via a causeway and bascule (opening) bridge (figure 3.1.11-1) from the mainland community of Mims to Merritt Island; 64 kilometers (40 miles) of track (the NASA Rail Line) provide heavy freight transport (National Aeronautics and Space Administration, 1997a). The distance from the proposed LTF site to this spur is approximately 5.8 kilometers (3.6 miles). The KSC railways are rated Class 4, for a maximum of 96.6 kilometers (60 miles) per hour. (Kennedy Space Center, 1998a)

Airways—Off-installation

Brevard airway facilities are described in section 3.1.11. The nearest corporate/commercial airport to KSC is Space Coast Regional, approximately 9.7 kilometers (6 miles) from the proposed LTF site. The Cape Canaveral AS Skid Strip is also available.

Airways—On-installation

The KSC Shuttle Landing Facility is available, but prior permission is required for its use (Taff, 1998). Statistics for the Shuttle Landing Facility can be found in table 3.1.11-2.

3.2.12 KSC UTILITIES

The ROI for utilities includes all or portions of the service areas of each utility provider that serves KSC and local communities.

3.2.12.1 Water Supply

Off-installation

Brevard County potable water capacity and demand are addressed in section 3.1.12.1.

On-installation

KSC, Cape Canaveral AS, and Patrick AFB are contracted to receive up to 19 million liters (5 million gallons) of water per day from the City of Cocoa, but usage averages only about 7.6 to 11.4 million liters (2 to 3 million gallons) per day (Larrabee, 1998). If one estimates 20 working days per month, the maximum capacity is 379 million liters (100 million gallons) per month. Of the total potable water provided in 1996, KSC used an average of 121 million liters (32 million gallons) per month (City of Cocoa, 1998).

3.2.12.2 Wastewater

Off-installation

Surrounding communities and KSC are served by separate municipal sewer systems. Brevard WWTP capacities are addressed in section 3.1.12.2. Volusia County has public treatment capacity of 204 million liters (54 million gallons) per day, with an unallocated daily capacity of 50.3 million liters (13.3 million gallons) for future growth (East Central Florida Regional Planning Council, undated).

On-installation

KSC maintains operating permits for six domestic WWTPs. Two, Sewage Treatment Plants 1 and 4, operate under FDEP and NPDES permits and provide service for approximately 80 percent of KSC's personnel, whereas the remainder are small package plants servicing outlying facilities and operational areas (Kennedy Space Center Environmental Program Office, 1997). Table 3.2.12-1 depicts capacity and demand for KSC domestic and industrial WWTPs. Sewage Treatment Plant 15 has been converted into Grease Treatment Plant 15, with a 30,300-liter (8,000-gallon) per day capacity (Kennedy Space Center Environmental Program Office, 1997). KSC WWTPs have a combined design capacity of 3 million liters (0.78 million gallons) per day.

Table 3.2.12-1: Kennedy Space Center Domestic Waste Treatment Plant Summary

Sewage Treatment Plant Domestic	Area Served	Design Capacity in million liters/million gallons/day	1993 Average Daily Flow in million liters/million gallons/day
1	Industrial	1.4 (0.375)	0.44 (0.116)
4	VAB	0.76 (0.20)	0.36 (0.096)
5	LC-39A	0.11 (0.030)	0.03 (0.008)
6	LC-39B	0.19 (0.050)	0.037 (0.010)
9	Fluid Servicing Area	0.053 (0.014)	0.023 (0.006)
10	Visitor Information	0.4 (0.10)	0.14 (0.038)
11	S-Band Antenna Site	0.057 (0.015)	0.015 (0.004)
M6-895 B	Industrial Area	1.42 (0.375)	0.53 (0.14)
	Hypergol Fire Training Area	0.026 (0.007)	
	Solid Rocket Booster Refurbishment Area		
	Parachute Refurbishment		
	LC-39A/LC-39B Tanks	0.78 (0.2)	0.53 (0.14)
Visitor Information Center Bus Wash Recycling System	Visitor Complex		
LICON Recycling System (evaporator)	Testing Laboratory	0.019 (0.005)	

Source: Kennedy Space Center Environmental Program Office, 1997.

The Hypergol Fire Training Area Tank treats an intermittent wastewater stream collected in a 473,175-liter (125,000-gallon), hypalon-lined tank. At the Solid Rocket Booster Refurbishment area, at Cape Canaveral AS Hangar AF, Thiokol filters its waste stream, checks the pH, and discharges to the Cape Canaveral AS main WWTP, and United Space Boosters, Inc. filters its waste stream, discharging to Class G-II groundwater. The Parachute Refurbishment Facility operates with a complete treatment and reuse system designed to require make-up water for evaporation losses only. LC-39A and 39B utilize holding tanks to treat wastewater; effluent is discharged to a percolation pond on a "per launch" basis. The Visitor Information Center Bus Wash Recycling System is a 100-percent, closed-loop, recycled wash water plant. The LICON Recycling System treatment consists of an evaporator system and an ultraviolet/peroxidation system rated at 38 liters (10 gallons) per minute. Treated effluent is reused in the testing laboratory. (Kennedy Space Center Environmental Program Office, 1997)

In addition to state-permitted facilities, KSC has 71 known operating septic tank systems, typically supporting small or temporary facilities and outlying areas (U.S. Department of the Air Force and National Aeronautics and Space Administration, 1993). An engineering

study, completed in 1998, identified all onsite sewage disposal systems (Kennedy Space Center Environmental Program Office, 1997).

3.2.12.3 Solid Waste

Off-installation

Brevard County solid waste facilities are described in section 3.1.12.3. Volusia County's Tomoka Farms Landfill has an expected capacity through 2010.

On-installation

Disposal, management, and recovery of non-hazardous wastes is accomplished by landfill and recycling facilities, and KSC solid waste management is the responsibility of each generating individual or organization. KSC generates as much as 35,353 metric tons (38,970 tons) of waste annually, including paper, plastic, food waste, wood, metals, yard waste, and construction/demolition debris (approximately 87 percent of the total waste). Kitchen and cafeteria garbage is separated and taken to the Brevard County landfill (Kennedy Space Center Environmental Program Office, 1997), as is certain construction/demolition debris.

In 1996, KSC opened a new landfill, located on Schwartz Road West and adjacent to the previous landfill site. It accepts only Class III waste materials (trash and paper products, plastic, glass, and construction/demolition and land clearing debris). This facility has estimated capacity for 13 to 49 years, based on assumed disposal rate scenarios of 318 metric tons (350 tons) per week (13 years) and 82 metric tons (90 tons) per week (49 years) (Kennedy Space Center Environmental Program Office, 1997). In 1997, the facility received approximately 10,886 metric tons (12,000 tons) of Class III wastes, whereas Cocoa's Central Disposal Facility received KSC wastes totaling 998 metric tons (1,100 tons) (Young, 1998).

3.2.12.4 Energy

Electricity—Off-installation

Brevard County energy resources are described in section 3.1.12.5.

Electricity—On-installation

Base electricity comes from Florida Power and Light via four KSC-owned feeder lines that supply approximately 150 million kWh annually to KSC switch yards, transformers, distribution lines, and substations (U.S. Department of the Air Force and National Aeronautics and Space Administration, 1993), which are NASA owned and operated by Base Operations. There are no scheduled outages, brownouts, or rationing for any utilities. Redundancy and backup utility systems can be designed into utilities as required (electricity is supplied from the plant via redundant loops). (Kennedy Space Center, 1998a) The utility transmission voltage for KSC is 115 kV; 13.2 kV power is available at Schwartz Road West, but would require the installation of a transformer; there is no

power currently available at Roberts Road (Thalasinos, 1999). Existing transmission lines are adequate, although most onsite utility structures are operating at or near design capacity and lifespan (U.S. Department of the Air Force and National Aeronautics and Space Administration, 1993).

Natural Gas—Off-installation

Natural gas capabilities for Brevard County are discussed in section 3.1.12.5.

Natural Gas—On-installation

Natural gas is available to KSC through high-pressure gas lines. Reductions in emissions from diesel fuel systems are anticipated as a result of current plans for conversion of existing diesel-fired hot water generators to natural gas, a center-wide effort to reduce fuel combustion-related air emissions (Kennedy Space Center Environmental Program Office, 1997). KSC consumes about 3,888,000 therms per year, with a considerable capacity for increased demand (Thalasinos, 1999).

3.2.13 KSC WATER RESOURCES

This section provides an overview of the surface and groundwater features, water quality, and flood hazard areas in the vicinity of KSC. In general, the ROI for groundwater is the local aquifers that are directly or indirectly used by KSC. The ROI for surface water is the drainage system/watershed in which KSC is located. As previously mentioned, the St. Johns River Water Management District administers the NPDES permit process at Cape Canaveral AS and KSC. For a general discussion of water resource regulations, refer to section 3.1.13.

3.2.13.1 Groundwater

Three aquifer systems underlie KSC: the surface aquifer, the intermediate aquifer system, and the Floridan Aquifer. The surface aquifer system, which is composed generally of sand and marl, is under unconfined conditions and is approximately 9 to 18 meters (30 to 60 feet) thick. The water table in the aquifer is generally located a few meters (feet) below the ground surface. Recharge to the surface aquifer is principally by precipitation.

Low permeability to relatively impermeable beds act as a confining unit of the intermediate aquifer. The aquifer is composed generally of interbedded gray-green silty clay and clayey sand and is approximately 8 to 27 meters (26 to 90 feet) thick. Recharge to the intermediate aquifer system is dependent on leakage through the surrounding beds of lower permeability. The relatively low hydraulic conductivity of the intermediate aquifer restricts the vertical exchange of water between the surface aquifer and the underlying confined Floridan Aquifer.

The Floridan Aquifer is the primary source of potable water in central Florida and is described in section 3.1.13.1. The Floridan Aquifer is composed of several carbonate

units with highly permeable zones. Groundwater in the Floridan Aquifer at KSC is highly mineralized (U.S. Air Force, 1997). The Floridan Aquifer system recharge areas are in Polk and Orange counties.

3.2.13.2 Surface Water

The surface waters surrounding KSC include portions of the Indian River, the Banana River, Mosquito Lagoon, and all of Banana Creek. In addition, there are various minor tributaries which discharge to these waters. These waters are best described as shallow estuarine lagoons with natural depths of less than 1.5 meters (5 feet), and oceanic influences are minimal (National Aeronautics and Space Administration, 1997a).

The surface drainage pattern on Merritt Island is multibasinal. Surface drainage is typically internal, being trapped in the ponds, lakes, sloughs, borrows, and man-made canals on the island. External drainage is conducted primarily by man-made drainage systems and by way of grove management pumps to the Indian River. Several water bodies in the Middle East Coast Basin are discussed in section 3.1.13.2.

All of the area of Mosquito Lagoon within KSC boundaries and the northern-most segment of the Indian River is designated as Class II. Class II standards are intended to maintain water levels to support shellfish propagation or harvesting. The remainder of the waters surrounding KSC are designated Class III. Class III standards are intended to maintain a level of water quality suitable for recreation and the production of fish and wildlife communities (U.S. Department of the Air Force and National Aeronautics and Space Administration, 1993).

Due to KSC's vastness, a single storm water management system is neither practical nor necessary. The KSC storm water management program encompasses the various scattered storm water systems. The LC-39 and industrial areas are relatively developed, with significant acreage of impervious surface, and both have storm water management systems that employ existing swales and ditches. (Kennedy Space Center Environmental Program Office, 1997) Only storm water discharged from the Hypergolic/Payload Test Area is treated at the Industrial Area and then discharged to the Banana River. Region 1 provides storm water treatment for the majority of the Industrial Area. Runoff in these ditches is directed to a large wet detention area, ultimately discharging to Buck Creek.

3.2.13.3 Special Flood Hazard Areas

See section 3.1.13.3 for a general description of Special Flood Hazard Areas. The majority of KSC, including the proposed LTF sites, is within a 100-year floodplain. EO 11988 directs Federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with occupancy and modification of floodplains. In addition, because average surface elevations are low (approximately 3 meters [10 feet] above msl), the proposed LTF sites could be subject to severe flooding from storm surge tides (National Aeronautics and Space Administration, 1992).

3.2.13.4 Water Quality

Groundwater quality of the surficial aquifer system is currently of good quality, but is very susceptible to contamination. There are a number of sites that either have caused, or have the potential to cause, localized contamination at KSC. The groundwater quality in the intermediate aquifer systems varies from moderately brackish to brackish. Because of the high mineral content, Brevard County ranked the Floridan Aquifer system beneath KSC as having a low-potential for well field site acceptability and is generally considered to be non-potable (National Aeronautics and Space Administration, 1997a; 1992).

Surface water quality near Cape Canaveral AS and KSC is described in section 3.1.13.4.

3.2.14 KSC ENVIRONMENTAL JUSTICE

For a description of EO 12898 and the methodology used for this analysis, see section 3.1.14.

A census tract is considered disproportionate under either of these two conditions: (1) the percentage of persons in low-income or minority populations in the census tracts exceeds the percentage in Brevard and Volusia counties, the region of comparison, or (2) the percentage of low-income or minority populations in the census tracts exceeds 50 percent. Data for each census tract were compared to data for the regional political jurisdiction surrounding the tract. For this analysis, the region of comparison was defined as Brevard and Volusia counties. Therefore, Brevard and Volusia counties were used as the ROI for the environmental justice analysis. Based on the 1990 Census of Population and Housing, Brevard County had a population of 398,978. Of that total, 35,815 persons, or 9.13 percent, were low-income, and 49,861 persons, or 12.45 percent, were minority. Volusia County had a population of 370,712. Of that total, 43,568 persons, or 12.14 percent, were low-income, and 51,091 persons, or 13.78 percent, were minority.

Brevard County is subdivided into 89 census tracts, of which 40 have a disproportionate percentage of low-income or minority populations (or both). Volusia County is subdivided into 72 census tracts, of which 30 have a disproportionate percentage of low-income or minority populations (or both). These census tracts have been determined to have disproportionate low-income and/or minority populations, and therefore may be subject to environmental justice impacts.

3.3 REDSTONE ARSENAL

The following sections discuss the affected environment or baseline conditions at RSA. This discussion includes the locations proposed for use by the LTF program as well as adjacent areas that have the potential to be impacted by program activities.

3.3.1 RSA AIR QUALITY

A general description of the air quality resource is presented in section 3.1.3. Applicable Federal and state regulations are presented in appendix C.

3.3.1.1 Meteorology

The climate at RSA is mild and temperate. The average annual temperature for Madison County is approximately 15°C (60°F). Average monthly highs of approximately 27°C (80°F) generally occur in July, and monthly lows near 4.5°C (40°F) can be expected in January. Freezing temperatures seldom continue for more than 48 hours. Precipitation occurs mostly as rain, but some snowfall can be expected each year. Rainfall averages approximately 140 centimeters (56 inches) annually, while snow varies from less than 2 centimeters (1 inch) to more than 50 centimeters (20 inches). Flooding is possible, but occurs infrequently. The greatest variety of weather normally occurs during the spring, with the majority of the area's thunderstorms occurring before summer. (U.S. Army Missile Command, 1994)

Winds generally originate from the southeast, though winds from the north, south, or northwest are not uncommon. Wind speed averages 14 to 18 kilometers per hour (8.5 to 11 miles per hour). (U.S. Army Missile Command, 1994)

3.3.1.2 Regional Air Quality

RSA is located in Madison County, which is in attainment for all criteria air pollutants. There are no PSD Class I areas in the vicinity of RSA, and it should be analyzed as a PSD Class II area.

3.3.1.3 Air Emissions Sources

RSA maintains permits to operate several air pollution emissions sources including boilers, and fuel storage tanks. Operations at RSA are in compliance with current state and Federal permits. (U.S. Army Materiel Command, 1996)

RSA also has a designated open burn area, which is operated according to conditions imposed by the Alabama Department of Environmental Management (ADEM).

RSA is in the process of obtaining a Title V Air Permit. It is likely that the permit will not be finalized until after the year 2000.

3.3.2 RSA AIRSPACE

A general description of the airspace resource is provided in section 3.1.2.

Affected Environment at RSA

The affected environment is defined by the obstruction standards listed on the Obstruction Evaluation Worksheet (FAA Form 7460-6). This worksheet identifies criteria to determine if a structure would be an obstruction to navigable airspace. The first set of criteria is used to determine if a structure exceeds the notice criteria requiring a notice to be filed:

- Structure more than 61 meters (200 feet) AGL
- Structure exceeds a slope from an airport—100 to 1 for a distance of 6.1 kilometers (3.8 miles) from a runway of more than 975 meters (3,200 feet) in length

The second set of criteria is used to determine if the structure exceeds the obstruction standards. The first potentially applicable criteria for RSA, Part V subparts 77.28(a) and (b), "Application of Airport Imaginary Surfaces, Military Airport and Runway Surfaces," will be used to generate a three-dimensional surface to determine if any LTF facilities are an obstruction to a military airfield. The second criteria, Part IV subparts 77.23 (a) (2), "Application of Obstruction Standards," will be used to determine if any LTF facilities are an obstruction to an airport.

The nearest military airport is the Redstone Army Airfield, located approximately 8.6 kilometers (5.3 miles) north of the proposed I&T Complex and 12.2 kilometers (7.6 miles) north of the proposed PTC Complex. Huntsville International Airport is approximately 9.8 kilometers (6.1) miles northwest of the I&T Complex and 12.5 kilometers (7.8 miles) northwest of the PTC Complex. The Redstone Army Airfield, elevation 209 meters (685 feet) msl, will be the origin for the military airfield imaginary surface and Huntsville International, elevation 192 meters (629 feet), will be the origin for the airport obstruction standards criteria application. Existing obstructions on RSA include elevations of 259 meters (850 feet) msl, 323 meters (1,060 feet) msl, 294 meters (965 feet) msl, and 286 meters (939 feet) msl. (National Ocean Service, 1999b)

The airspace above the proposed I&T and PTC Complexes at RSA is restricted airspace R-2104A, D. R-2104 is managed by the Memphis Air Route Traffic Control Center. The altitude for R-2104A is from surface to 3,658 meters (12,000 feet), time of use is intermittent 0600–2200, Monday–Saturday, 6 hours in advance or by NOTAM. The altitude for R-2104D is from 3,658 meters (12,000 feet) to Flight Level 300, time of use is 6 hours in advance or by NOTAM. Huntsville International has class C airspace, with operational altitudes of surface to 1,402 meters (4,600 feet), 610 meters (2,000 feet) up to 1,402 meters (4,600 feet), and 732 meters (2,400 feet) up to 1,402 meters (4,600

feet). Airspace within the Class C excludes R-2104 A when activated. (National Ocean Service, 1999b)

3.3.3 RSA BIOLOGICAL RESOURCES

A definition of biological resources is presented in section 3.1.3. The ROI for biological resources includes areas on RSA that may be affected by project activities, such as construction, noise, and human presence.

3.3.3.1 Vegetation

A variety of vegetation communities can be found on RSA. Within these communities, the Alabama Natural Heritage Program lists 242 plant species, including herbaceous vegetation. (U.S. Department of the Army, 1996)

Upland vegetation on RSA is generally mowed, maintained in an early ecological successional stage, or retained as forest. Forested land composes about 40 percent of the acreage, with the remainder in pastures and scrub. The forest portion consists of hardwoods, pines, and mixtures of each type. (U.S. Army Missile Command, 1994)

Chestnut oak, blue beach, water oak, sweetgum, tulip poplar, sugarberry, and willow oak generally dominate mixed hardwood canopies. Middlestory species include the canopy species mentioned above and red bud, black gum, and eastern red cedar. Ground cover among the hardwoods is generally sparse. Species occurring in herbaceous and shrub layers include pepper-vine, poison ivy, Virginia creeper, potentilla, grape, greenbrier, blackberry, white snakeroot, Japanese honeysuckle, and ebony spleenwort. (U.S. Army Missile Command, 1994)

Loblolly pine, with some shortleaf pine, dominates the pine community. Most older pine stands are very dense with minimal ground cover. Where ample sunlight reaches the forest floor, a variety of species occurs in the lower vegetation layer. Middlestory and shrub layers are composed of pines, box elder, sweetgum, blackberry, mimosa, greenbrier, sassafras, staghorn, and winged sumacs, honey-locust, grape, and young white oak. Japanese honeysuckle, poison ivy, broomsedge, grasses, asters, and components of upper layers dominate the herbaceous layer. Much of the open forested land is covered with kudzu, non-native vegetation that is seriously threatening natural vegetation survival and diversity on over 809 hectares (2,000 acres) of RSA. (U.S. Army Missile Command, 1994)

Mountainous uplands on RSA support eastern red cedar and oak hickory woodlands on the drier, more exposed slopes, and beech, sugar maple, and yellow poplar on moist sites. In rocky soils at higher altitudes, disturbances, such as fires, on Hatton and Bradford Mountains have encouraged growth of mixed hardwood and Virginia pine forests. (U.S. Army Missile Command, 1994)

Large mowed fields, pasture, and hay fields, planted with varieties of fescue, lespedeza, and rye grass, can also be found on RSA. Fields that are not managed for agriculture are covered by broomsedge, a variety of grasses, and seedlings of tree and shrub species. Also, upland areas with deep soils, such as old agricultural land and areas around buildings, have been planted with loblolly pines. (U.S. Army Missile Command, 1994)

3.3.3.2 Wildlife

The diverse habitats represented at RSA support a wide variety of wildlife. The presence of the 1,619-hectare (4,000-acre) Wheeler National Wildlife Refuge adds to this diversity. Collectively, the wide range of upland, wetlands, and aquatic habitats and the large size of RSA result in use of the area by a significant number of wildlife species. (U.S. Army Missile Command, 1994)

RSA provides suitable habitat for carnivores such as the red and gray fox, bobcat, and mink. Opossum, cottontail, beaver, gray squirrel, woodchuck, coyote, raccoon, and skunk are also found on RSA. Several species of game birds such as the northern bobwhite, mourning dove, wild turkey, and several species of duck are common on RSA. Red-tailed and sharp-shinned hawks, great horned owls, American kestrels, and eastern screech owls are raptors that are present on RSA. Wetlands provide a significant amount of waterfowl habitat. (U.S. Army Missile Command, 1994)

A wide variety of aquatic invertebrate species have been collected in dredge samples from Huntsville Spring Branch and Indian Creek. (U.S. Department of the Army, 1996)

3.3.3.3 Threatened and Endangered Species

Table 3.3.3-1 shows the species with Federal or state status that are located on or near RSA.

Moderate habitat exists on RSA for the Price's potato-bean (*Apios priceana*), a Federal threatened plant that grows in mixed hardwoods or clearings. Moderate habitat is also present in limestone outcroppings for the Federally endangered Morefield's leatherflower (*Clematis morefieldii*), but it has not been identified on RSA. (U.S. Army Missile Command, 1994; Redstone Arsenal, 1998b)

Limited habitat exists on RSA for the Federally and state endangered Mohr's Barbara's buttons (*Marshallia mohrii*). It occurs in moist to wet springs and natural clearings in mountainous areas. The Federal endangered Tennessee yellow-eyed grass (*Xyris tennesseensis*) is found in calcareous soils of mountain seeps, wet meadows, and along spring fed streams. (U.S. Army Missile Command, 1994)

The U.S. Army Aviation and Missile Command (AMCOM) Directorate of Environmental Management and Planning (DEMP) at RSA is currently funding monitoring of the Price's potato-bean, dwarf trillium (*Trillium pusillum* var. *alabamicum*) and Harper's umbrella plant

(*Erigonum longifolium* var *harperi*), Federal Species of Concern, and American ginseng (*Panax quinquefolius*), a state-regulated species (Redstone Arsenal, 1999b).

Table 3.3.3-1: Species with Federal or State Status Potentially Occurring at RSA

Scientific Name	Common Name	Status: State	Status: Federal
Plants			
Apios priceana	Price's potato-bean	—	T
Clematis morefieldii	Morefield's leather flower	—	E
Eriogonum longifolium var *harperi*	Harper's umbrella plant	—	SC
Marshallia mohrii	Mohr's Barbara's buttons	—	T
Panax quinquefolius	American ginseng	Regulated by permit	Candidate 3C
Trillium pusillum var. *alabamicum*	Dwarf trillium	—	SC
Xyris tennesseensis	Tennessee yellow-eyed grass	—	E
Crustaceans			
Palaemonias alabamae	Alabama cave shrimp	SP	E
Reptiles and Amphibians			
Aneides aeneus	Green salamander	SP	—
Alligator mississippiensis	American alligator	SSC	T (S/A)
Fish			
Etheostoma tuscumbia	Tuscumbia darter	SP	SC
Typhlichthys subterraneus	Southern cavefish	SP	—
Birds			
Falco peregrinus anatum	Peregrine falcon	SP	FE
Haliaeetus leucocephalus	Bald eagle	SP	T
Picoides borealis	Red-cockaded woodpecker	—	E
Mammals			
Felis concolor cougar	Eastern cougar	—	E
Myotis grisescens	Gray bat	SP	E
Myotis sodalis	Indiana bat	SP	E

Source: U.S. Army Missile Command, 1994; Alabama Natural Heritage Program, 1995; National Aeronautics and Space Administration, 1997c; Redstone Arsenal, 1998b; 1999b.

- Not listed
SP State Protected
E Endangered
FE Formerly Endangered
T Threatened
(S/A) Listed by similarity of appearance to a listed species
SC Species of Concern
SSC State Species of Concern

The Federally endangered Alabama cave shrimp (*Palaemonias alabamae*) are known only to exist in Madison County, Alabama, and have been found in flooded caverns on RSA. Little data is available about this species, but their preferred habitat is subterranean pool

lying over a silt substrate. These small shrimp have no eyes and no pigmentation except around the thorax region. The AMCOM DEMP at RSA is currently funding habitat and life history investigations on the Alabama cave shrimp species. (U.S. Army Missile Command, 1994)

The American alligator occurs in rivers, swamps, small and large ponds, sloughs, and freshwater and brackish marshes. Over a decade ago, a number of alligators were released on Wheeler National Wildlife Refuge. An estimated 40-50 alligators are currently found on the refuge, and at least one active nest was located during the summer of 1998 (U.S. Fish and Wildlife Service, 1999a). Alligators have been sighted, and even captured, on RSA; however, these occurrences are infrequent. (U.S. Army Missile Command, 1994)

Although bald eagles are known to exist in Wheeler National Wildlife Refuge, they occur merely as transient migrants on RSA. No known nesting attempts have been made, and the birds are absent during the spring and summer months. No red-cockaded woodpeckers have been observed on RSA (Redstone Arsenal, 1998b). Moderate habitat is present for the Federal and state endangered gray (*Myotis grisescens*) and Indiana (*Myotis sodalis*) bats. The bats use RSA for foraging habitat (Redstone Arsenal, 1998b). (U.S. Army Missile Command, 1994) The Indiana bat has not been trapped (mist netted) on RSA (Redstone Arsenal, 1999b).

A complete survey of RSA for threatened and endangered species performed in 1995 did not identify any endangered species in the proposed areas (Alabama Natural Heritage Program, 1995). An Endangered Species Management Plan has been developed by the AMCOM DEMP. The Endangered Species Management Plan describes the listed and proposed endangered and threatened species and ecologically sensitive areas found on the Installation; conservation goals for these species and associated habitats; management prescriptions; monitoring and inventory programs; and funding requirements for plan implementation. The plan would serve as a guide for the conservation of biological diversity through the protection of listed, proposed, and candidate species and the associated critical habitats. (U.S. Army Aviation and Missile Command, 1999)

Implementing the plan would improve sustainability of healthy, diverse, and productive plant resources, animal communities, and aquatic habitats on the Installation to further support habitat and species biodiversity. Implementing the plan would specifically benefit threatened and endangered flora and fauna indigenous to RSA and their habitats. (U.S. Army Aviation and Missile Command, 1999)

3.3.3.4 Environmentally Sensitive Habitats

Environmentally sensitive habitats on RSA include wetlands and Wheeler National Wildlife Refuge. Additional environmentally sensitive areas listed in the Natural Heritage Inventory and the Endangered Species Management Plan include William's Spring, Weeden and Madkin Mountains, Huntsville Spring Branch, Bell Bluff, Lehman's Bluff, sandstone outcroppings, caves, and Bradford Sinks (Swan Pond Wetland Complex).

Wetlands

Over 20 percent of RSA land is considered wetland. Wetland communities at RSA include: (1) riparian areas associated with the major floodplains, such as Huntsville Spring Branch, Indian Creek, and McDonald Creek; (2) terrace wetlands such as oak flats where the water table is close to the surface during part of the year; and (3) spring-fed basins such as Swan Pond and the system near the Fishing Hole Cave. About half of these wetlands are found within the Wheeler National Wildlife Refuge. They are characterized by swampland and bottomland hardwood forest. Palustrine emergent wetlands (marshlands) are mainly found on the test ranges, although some are in pastures and along edges of ponds. More than one-quarter, or 4,047 hectares (10,000 acres), of RSA is affected by high stages of the Tennessee River and other tributary streams. The primary streams that traverse the installation are Huntsville Spring Branch, Indian Creek, and McDonald Creek. (U.S. Department of the Army, 1996)

The sites proposed for use by the LTF program are not located within wetlands areas. Wetlands are located adjacent to the proposed PTC Complex site.

Wheeler National Wildlife Refuge

Wheeler National Wildlife Refuge lies west and south of RSA, and a small part extends onto Marshall Space Flight Center (MSFC) property. The refuge is located along the Tennessee River north of MSFC to just below Slaughter Landing on RSA. The refuge was established in 1938 and is composed of 13,962 hectares (34,500 acres). It is considered the easternmost national wildlife refuge of the lower Mississippi Flyway, and 115 species of fish, 74 species of reptiles and amphibians, 47 mammals, and 285 species of birds are listed as occurring there. Habitat types on Wheeler Refuge include bottomland hardwoods, wetlands, pine uplands, shoreline or riparian woodlands, agricultural fields, and backwater embayments. The Refuge manages approximately 1,416 hectares (3,500 acres) of cropland. Local farmers on a share arrangement grow crops and leave a portion in the field for wildlife as payment for use of the land. (U.S. Fish and Wildlife Service, 1998)

3.3.4 RSA CULTURAL RESOURCES

For a definition of cultural resources and the cultural resources ROI, as well as a description of the types of laws and regulations that govern these resources, see section 3.1.4.

3.3.4.1 Prehistoric and Historic Archaeological Resources

Archaeological investigations at RSA and MSFC indicate that human occupation of the Wheeler Basin first occurred approximately 13,000 years ago. Because of the diverse topography, fertile soils, abundant water, and varied plant and animal habitats, the area is among the earliest populated in the southeastern United States. Prehistoric occupation of the area is most simply divided into five successive periods—the Paleo-Indian Period (approximately 11,000 BC to 8000 BC), the Archaic Period (approximately 8000 BC to 1000 BC), the Gulf Formational Period (1000 BC to 300 BC), the Woodland Period (300

BC to AD 900), and the Mississippian Period (AD 900 to 1500). The last of the prehistoric Periods ended with the arrival of Euro-American fur traders (U.S. Army Materiel Command, 1996).

Huntsville and the area of RSA remained under the control of indigenous populations until the beginning of the nineteenth century, when there was a westward movement of Euro-American settlers toward the Tennessee River. From this time, hostilities existed between the Indian tribes as well as between the tribes and Euro-American settlers; however, those tensions stopped when the Creek were defeated at Horseshoe Bend in 1814. After the Creek War, settlement of the area grew rapidly and was largely focused on the farming of cotton—an industry that dominated the region around RSA and Huntsville for nearly 45 years (National Aeronautics and Space Administration, 1996). By 1850, the area had established itself as one of the most prosperous agricultural areas in the South, and that prosperity was reflected in the abundance of large houses on the farms and in the "planter" towns.

During the Civil War, raids and detached engagements kept the whole of north Alabama under constant tension. The Federal garrison at Madison was attacked and the station destroyed in 1864, and numerous other encounters occurred in and around the Huntsville area throughout the war years. During the 15 years after the war, the Huntsville area struggled with a series of obstacles to the restoration of the pre-war economy—the abolition of slavery, the war destruction of the transportation network, a series of droughts in the late 1860s, and the volatility of the commodity markets (National Aeronautics and Space Administration, 1996). Construction of several large factories (the Dallas Manufacturing Company in 1891 and the Lincoln mills in 1918) helped to stabilize the economy somewhat, but when the cotton industry waned in the 1920s, the Huntsville economy became as depressed as many other communities in the United States.

During World War II, the Huntsville area was selected as the site for the nation's newest chemical warfare manufacturing plant (Huntsville Chemical Plant) and shell-loading plant (RSA). Both were completed by 1942 and operated over a 4-year period. At the end of the war, the manufacturing from both plants essentially ceased and, until the Army relocated its rocket research and development program from White Sands, New Mexico, to Huntsville around 1950, there was little activity on the installation. Under the direction of Dr. Wernher von Braun, the Ordnance Guided Missile Center was established (originally the Army Ballistic Missile Agency and renamed the MSFC in 1960) at the location of the two plants and the Huntsville economy finally stabilized through rocket research activities; these activities continue to the present (National Aeronautics and Space Administration, 1996).

Numerous archaeological investigations have been conducted in the general area of RSA, the earliest of which were conducted by Moore in 1915 and Fowke in 1928 (National Aeronautics and Space Administration, 1996). An extensive archaeological survey of the Tennessee River valley was conducted by the University of Alabama in 1933 before construction of the Pickwick, Wheeler, and Guntersville Dams, and hundreds of sites were recorded. Several sites were also recorded by Webb in 1939 in the Wheeler Lake area.

Following this early research, few archaeological studies were conducted in the vicinity of the ROI for several decades; however, as a result of Federal legislation in the late 1960s, studies began again. The most extensive of these were of the Wheeler National Wildlife Refuge undertaken by Futato in 1979; selected areas of RSA, undertaken by Alexander in 1979; and areas within and adjacent to the eastern boundary of RSA by Thomas in 1980. In addition, investigations by Shogren, et al., in 1989 and Knight in 1990 recorded platform mounds and an Afro-American cemetery along the boundaries of RSA (National Aeronautics and Space Administration, 1996). Surveys of the proposed addition to the Sparkman Center in 1990, and several roadway improvement surveys conducted under Base Realignment and Closure in 1992, failed to locate any new sites (U.S. Army Materiel Command, 1996). In 1998, four Phase I Archaeological surveys were completed and coordinated with SHPO. TRC Garrow completed two surveys for a total of 1,337 hectares (3,304 acres). Alexander Archaeological Consultants completed two surveys for a total of 3,086 hectares (7,626 acres). The SHPO has concurred with the results of these four surveys. Currently 2,185 hectares (5,400 acres) are being surveyed by Alexander Archaeological Consultants who will coordinate with SHPO when completed. (Redstone Arsenal, 1999a)

As of 1998, approximately 340 prehistoric and historic archaeological sites had been recorded within the boundary of RSA; however, 39 percent of the installation has actually been systematically surveyed. The total number of sites presumably represents only a small fraction of the 1,000 sites estimated to be present on the installation. Of the recorded sites, none are currently listed in the National Register; 121 sites have been determined eligible for listing and 219 have been recommended as ineligible—the Alabama SHPO has concurred (Redstone Arsenal, 1998b; U.S. Army Missile Command, 1994). In addition, there are 46 identified historic period cemeteries within the boundary of the installation (dates ranging from 1820 to 1940)—none are listed, or currently eligible for listing in the National Register. Final recommendations of the current survey will likely modify these data.

Prehistoric and/or historic archaeological sites within the ROI for LTF include one historic site (un-numbered but included as part of the National Register registration form for the Harris House); one site within the direct ground disturbance area for the LTF PTC Complex (Site 1Ma 630, which is potentially eligible for inclusion in the National Register); two sites within the 549-meter (1,800-foot) ESQD (sites 1Ma 629 [not currently recommended as potentially eligible] and 1Ma 269 [currently recommended as potentially eligible]); and several sites within the Laser Safety Zone, some of which are potentially eligible (Holland, 1998). There are also two historic cemeteries within the ROI. The Penland-Cooper cemetery is located near the Harris House and within the ROI for the LTF I&T Complex, and an unnamed cemetery is located within the 549-meter (1,800-foot) ESQD for the LTF PTC Complex between Igloos 8308 and 8307.

3.3.4.2 Historic Buildings and Structures

Historic buildings and structures at RSA would be associated with any of the historic activities described in section 3.1.4.1 (e.g., farm and homestead sites, small communities,

tenant slave and soldier quarters, remains of early manufacturing plants, public and private cemeteries).

In 1984, a historic buildings and structures inventory was conducted by Building Technology Incorporated for RSA (which included the MSFC) and formally coordinated with the Alabama SHPO (National Aeronautics and Space Administration, 1996). Only four buildings and structures were determined to be historically significant—all are associated with the MSFC and none are within the ROI for LTF. The four properties, all of which are now listed on the National Register and designated National Historic Landmarks include the Redstone Rocket Test Facility, the Neutral Buoyancy Space Simulator, the Propulsion and Structural Test Facility, and the Saturn V Dynamic Structural Test Facility (National Aeronautics and Space Administration, 1997b).

Since the survey is over 10 years old and many buildings have become 50 years old since 1984, the SHPO no longer accepts the findings. World War II and Cold War architectural historic surveys are underway. In an effort to reply to SHPO's comments on the findings in the World War II and Cold War surveys, the AMCOM DEMP has contracted with Historic Resources Assessments to prepare a Cold War historic context for RSA and conduct additional assessments of Cold War buildings. Two Cold War districts involved with the Army's role in the space program have been tentatively identified: Ordnance Missile Laboratories District with 8 buildings and a period of significance from 1950 to 1956; and the Army Ballistic Missile Agency District with 60 contributing buildings and 9 non-contributing buildings and a period of significance from 1950 to 1960. New South Associates is conducting additional studies on World War II buildings in reply to SHPO's comments on the Panamerican Consultants World War II architectural historical inventory report. These additional studies should be completed by the end of 1999 and will be coordinated with SHPO for concurrence. (Redstone Arsenal, 1999a)

In addition, the Sam Harris House (Building 8012) is considered "locally unique" because of its association with homesteading in the RSA area. The original construction date of the house is not known, but it is believed to have been created by joining two houses (including a former slave quarters) around 1927; there is an associated cemetery (the Penland-Cooper cemetery). The house has been determined eligible for listing in the National Register (U.S. Army Materiel Command, 1996) and is situated immediately adjacent to the LTF I&T Complex.

Four additional facilities were evaluated for listing in the National Register by the Mobile District Corps of Engineers in 1995 and determined to be ineligible. The four properties include buildings 3465, 3470, 4488, and 5681; the Alabama SHPO has concurred (U.S. Army Materiel Command 1996). Building 4488 has been determined exceptionally significant as a contributing member of the Army Ballistic Missile Agency Cold War District. Dr. Wernher von Braun's office was located in this building. (Redstone Arsenal, 1999a)

Buildings and structures within, or immediately adjacent to, the ROI include the Harris House; 70 weapons storage igloos, five of which are within the direct ground disturbance

footprint of the LTF PTC Complex (buildings 8330, 8331, 8338, 8339, and 8340—all constructed in 1942) and 65 of which are within the LTF PTC Complex ESQD, and Building 8027 (constructed in 1942) located adjacent to the proposed I&T Complex. The 70 weapons storage igloos and Building 8027 have been evaluated for eligibility for inclusion in the National Register under the World War II and Cold War historic contexts (U.S. Army Missile Command, 1997; Wu, 1999). However, since concurrence from the Alabama SHPO has not yet been received, they must be treated as potentially eligible.

3.3.4.3 Native Populations/Traditional Resources

At the time of Euro-American contact, the area of Huntsville and RSA was populated by several tribes, among them the Cherokee, Chickasaw, Coushatta, Creek, and Shawnee Indian tribes. Tribal boundaries were under constant dispute, and the area was hostile and unsettled. In 1786, the boundaries of two of the tribes were formalized under the Treaty of Hopewell, which placed a Cherokee/Chickasaw boundary line through Madison County. However, neither tribe appeared to have occupied the region after the treaty was ratified.

In 1830, the Indian Removal Act authorized relocation of many Native American tribes to the western United States. One of the most notable of the relocations involved the Five Civilized Tribes of the Choctaw, Chickasaw, Creek, Cherokee, and Seminole (Klegler, 1999). Most of the Native American peoples living in the area of RSA were relocated at that time. Very few remained; of those that chose to stay, ownership of all land in Alabama was relinquished to the U.S. Government. The Tunica-Biloxi tribe has contacted the AMCOM DEMP and requested to be included in their Native American consultation process (Redstone Arsenal, 1999a).

Significant traditional resources sites are subject to the same regulations and are afforded the same protection as other types of historic properties. Traditional sites associated with the identified tribes could include archaeological and burial sites, mounds, ceremonial areas, caves, rockshelters, hillocks, water sources, plant habitat or gathering areas, or any other natural area important to this culture for religious or heritage reasons. By their nature, traditional resources sites often overlap with (or are components of) archaeological sites. As such, some of the National Register-listed or -eligible sites identified at RSA could also be considered traditional resources sites or contain traditional resources elements. Currently, no traditional cultural properties have been formally identified within the ROI.

3.3.5 RSA GEOLOGY AND SOILS

This section provides an overview of the physiography, geology, soils, and geologic hazards in the vicinity of RSA. In general, the ROI is defined by the regional geologic setting and the areas in the immediate vicinity of the proposed PTC Complex and I&T Complex that could be affected by construction and operation activities.

3.3.5.1 Physiography

The topography of RSA is gently rolling, with elevations primarily in the range of 183 to 198 meters (600 to 650 feet) above msl. The terrain generally slopes from north to south toward the Tennessee River. Peak elevations of approximately 380 meters (1,240 feet) above msl occur in the north central portion of the installation in the Weeden and Madkin Mountains. Low areas are composed of valleys and floodplains along the Tennessee River and its tributaries to the north and are characterized by elevations of approximately 169 to 171 meters (556 to 560 feet) above msl. Elevation at the proposed LTF complex areas is approximately 183 meters (600 feet) above msl (Geological Survey of Alabama, 1975).

3.3.5.2 Geology

The geologic units underlying RSA are sedimentary in origin and are composed of Tuscumbia Limestone, Fort Payne Chert, Chattanooga Shale, and other older geologic units. In mountain areas, Ste. Genevieve Limestone, Harselle Limestone, and Bangor Limestone overlie the Tuscumbia Limestone. The surface geology consists of unconsolidated sedimentary material (regolith), primarily derived from weathering of bedrock. Regolith formed from the Tuscumbia Formation, consists of clay and rectangular to irregular blocks of chert. The Regolith thickness varies from approximately 6 to 12 meters (20 to 40 feet) in the northeast part of RSA to as much as 24 meters (80 feet) in the southern and western portions. (U.S. Army Missile Command, 1994)

3.3.5.3 Soils

The soil survey of Madison County identified six different soil associations within RSA. The predominant soil type mapped for the installation consists of a deep, well drained to moderately drained, silt loam to silty clay loam. These soils typically possess a loamy surface horizon underlain by a loamy to clayey subsoil layer with lenses of silty and/or sandy clay. Rock fragments generally occur throughout the clayey material. Soil depths range from very shallow on the mountains to much deeper along the larger tributaries of the Tennessee River. Soils at the proposed LTF complexes are of the Holston-Tupelo-Robertsville soil association and are considered poorly to moderately well drained with variable permeability (Geological Survey of Alabama, 1975).

Areas of prime farmland are located throughout the level to gently sloping portions of RSA, including uplands, foot slopes, stream terraces, and floodplains. However, the Natural Resources Conservation Service has determined that the prime farmland areas at the installation are excluded from consideration as prime farmland in accordance with the Farmland Protection Policy Act (U.S. Army Missile Command, 1994).

3.3.5.4 Geologic Hazards

Unstable Soils

Soils within the vicinity of the PTC Complex and I&T Complex exhibit a low to moderate shrink/swell susceptibility and moderate susceptibility to water and wind erosion (Iowa

State University Statistical Laboratory, 1998). Consequently, no construction problems associated with unstable soils are anticipated.

Seismicity

RSA is located in a seismic zone 1, according to the Uniform Building Code. Within this seismic zone there is a low probability of earthquakes. (U.S. Department of the Army, 1997) There are no known areas of volcanic activity within the State of Alabama.

3.3.6 RSA HAZARDOUS MATERIALS AND HAZARDOUS WASTE MANAGEMENT

For a general discussion of the regulations governing hazardous materials and hazardous waste management and for a discussion of the ROI, see section 3.1.6.

3.3.6.1 Hazardous Materials Management

Numerous types of hazardous materials are used annually to support the various missions and general maintenance operations at RSA. These materials include common building paints, industrial solvents, fuel oil, and gasoline. Hazardous materials are also used by onsite contractors supporting installation operations.

Hazardous materials management is the responsibility of each individual or organization. The DEMP oversees all hazardous materials activities and promulgated Hazardous Material/Waste Management System Operating Procedures. DEMP has established a tracking system that records and labels each hazardous material item and monitors its storage and use. (U.S. Army Missile Command, 1997)

Hazardous materials are turned over to DRMO, which attempts to find another user for the material. If a new user cannot be located, the material is declared waste and is disposed of offsite in a permitted treatment, storage, and disposal facility by a RCRA approved contractor. The AMCOM Disaster Control Plan for RSA and the AMCOM Regulation 420-5 require an SPCC Plan and Installation Spill Contingency Plan for oil and hazardous substances. The DEMP also maintains Spill Plans for MSFC and the AMCOM Base Support Contractor. (U.S. Army Missile Command, 1996) RSA has a hazardous materials response team.

3.3.6.2 Hazardous Waste Management

Hazardous waste management at RSA is regulated under 40 CFR 260-280 and Alabama Administrative Code 22-30, *Hazardous Waste Management*. These regulations are implemented through AMCOM Regulation 200-2, Chapter 5, "Hazardous and Solid Waste Management." Storage, treatment, and disposal hazardous waste operations are conducted in accordance with RCRA Part B permit (AL7-210-020-742). The DEMP's Hazardous Material/Waste Management System Operating Guidelines define specific procedures for analyzing and turning in hazardous wastes. (U.S. Army Missile Command,

1997) Biennial reports of all hazardous waste material generated by the Army and Thiokol are sent to ADEM.

RSA is a Large Quantity Generator of hazardous wastes. All hazardous waste generated is labeled with the appropriate U.S. EPA identification number and is transported, treated, and disposed of under this number. All individuals or organizations at RSA are responsible for administering all applicable regulations and plans regarding hazardous waste, and for complying with applicable regulations regarding the temporary accumulation of waste at the process site. The wastes are stored at the point of generation in appropriate plastic or steel containers for up to 90 days. From the point of generation, wastes are stored onsite for up to 1 year in nine modified, watertight hazardous waste igloos before disposal offsite. These igloos are located on 23 hectares (51 acres) on the southern part of the installation in a fenced restricted area, and are constructed of reinforced concrete with secondary containment. Each igloo has the capacity to store 240 drums, and each is designated for the storage of one type of waste (e.g., ignitable, corrosive, reactive, or toxic). Typically, the storage site operates at less than 50 percent capacity. RSA reported the generation of approximately 192,775 kilograms (425,000 pounds) of hazardous waste in 1997. (Hubbard, 1998) Typical hazardous wastes at MSFC include solvents, paints, and acid cleaning solution.

The DRMO is responsible for managing and marketing excess and recoverable products and waste materials in accordance with applicable regulations. Hazardous items that cannot be marketed by the DRMO are disposed of as hazardous wastes.

3.3.6.3 Pollution Prevention

U.S. Army Regulation (AR) 200-1, Chapter 10, "Pollution Prevention," outlines the Army policy for pollution prevention. The Army's primary pollution prevention goal is to reduce reliance on products or processes that generate environmentally degrading impacts to as near zero as feasible. Under this regulation all installations must prepare a pollution prevention plan. RSA has prepared a Pollution Prevention Plan that meets this policy. The Pollution Prevention Plan establishes the overall strategy and describes specific objectives for reducing pollution of the ground, air, surface water, and groundwater. The purpose of the Pollution Prevention Plan is to provide sufficient guidance to pollution prevention management and operations on RSA. Specific goals include implementation of management practices that eliminate or reduce the use of hazardous materials, increase efficiency in the use of raw materials, protect natural resources, and source reduction through recycling, treatment, and disposal practices.

The DEMP's Hazardous Material/Waste Management System Operating Procedures describe pollution prevention as all actions necessary to include the use of processes, practices, products, or management actions that eliminate or reduce undesirable impacts on human health. These actions include source reduction, recycling, treatment, and disposal.

3.3.6.4 Remediation

In response to requirements outlined in the RSA's RCRA Part B permit, a RCRA Facility Assessment was performed by the U.S. EPA in 1989. The investigations were supplemented by a 1991 study. The two studies identified 289 Solid Waste Management Units and Areas of Concern on RSA. Contaminates identified as being suspected at the Solid Waste Management Units/Areas of Concern include heavy metals, pesticides, volatile organic compounds, and chemical warfare materials. As a result of the findings from several RCRA Facility Investigations (RFIs), RSA was placed on the U.S. EPA's National Priorities List on June 30, 1994. RSA is currently negotiating with U.S. EPA and the ADEM for a Federal Facilities Agreement. (U.S. Army Missile Command, 1994)

Currently, 91 sites are being investigated under RSA's Investigation/Remediation Program. Of these sites, 42 sites are at the site investigation phase, and 49 sites are at RI/FS Phase. There are 11 sites undergoing Interim Remedial Action/Removal Alternatives. Three are receiving earthen cap and cover; six are receiving groundwater treatment systems; two are being excavated and contamination removed. Review of historical records, aerial photography, and other information have revealed no known contamination at the sites proposed for LTF facilities. (Redstone Arsenal, 1998a) There is one CERCLA site (RSA 110) in the buffer zone. RSA is remediating groundwater in and adjacent to the buffer zone. The studies have shown that contaminated groundwater in the LTF area moves slowly to the northeast, away from the LTF site.

3.3.6.5 Storage Tanks

For a general discussion of storage tank regulation, see section 3.1.6.5.

As of 1999, RSA has 61 active tanks, and 8 ADEM registered USTs. The eight active tanks meet the 1999 RCRA standards. Nine other USTs, which were out of service, were removed in early 1998. (Davis, 1999) The regulated tanks store gasoline, aviation gasoline, diesel, and used oil, while the unregulated tanks store heating oil. RSA is in compliance with all U.S. EPA and Alabama storage tank regulations. There are no reported storage tanks in the areas proposed for LTF facilities. (Redstone Arsenal, 1998a)

3.3.6.6 Asbestos

For a general discussion of asbestos regulation, see section 3.1.6.6.

Building construction at RSA began in the 1940s (U.S. Army Materiel Command, 1996). As such, many of the older buildings have been surveyed for ACM (Davis, 1999). Building 8027 is known to contain asbestos in floor tiles and in pipe and tank insulation. Building 8339 and the other igloos have not been tested but are not thought to contain asbestos as they were constructed out of concrete and dirt. (Crutcher, 1999)

3.3.6.7 Polychlorinated Biphenyls

For a general discussion of PCBs and their regulation, see section 3.1.6.7.

A survey of all large transformers for PCBs was completed at RSA in 1975. All large transformers containing PCBs were disposed of according to regulations. The U.S. EPA has allowed RSA to test pole mounted transformers for PCBs as they are taken out of service. When transformers are found to have less than 50 ppm PCB concentration, they are sold through DRMO. Those transformers found to contain more than 50 ppm PCBs are disposed of by a PCB disposal contractor at an approved disposal facility. PCB-contaminated equipment could occur at the existing facilities proposed for modification for LTF. PCB contamination in transformers and other equipment must be verified or tested before proceeding with facility modifications.

3.3.6.8 Lead-based Paint

For a general discussion of lead and its regulation, see section 3.1.6.8.

Although lead-based paint surveys have been conducted in certain buildings at RSA, none of the structures proposed for LTF have been tested. Prior to any building demolition or modifications, the construction contractor may be required to conduct a lead-based paint survey.

3.3.7 RSA HEALTH AND SAFETY

For a definition of health and safety resources, definition of the ROI, and a description of the types of laws and regulations that govern these resources, see section 3.1.7.

3.3.7.1 Regional Safety

Redstone Arsenal Support Activity has entered into a mutual aid agreement with cities within an 80-kilometer (50-mile) distance to provide assistance in the event of an on-station emergency. Each organization may request equipment and manpower in the event of a fire or other emergency. In an emergency that may affect off-station areas, Redstone Arsenal Support Activity contacts the appropriate county emergency management staff. (Redstone Arsenal, 1998a)

3.3.7.2 On-station Safety

Health and safety for construction and contractor-supported activities is regulated under USACE Engineer Manual 385-1-1, *Safety and Health Requirements Manual*. The provisions of this manual implement safety and health standards and requirements contained in 29 CFR 1926, 29 CFR 1960, 30 CFR 56, EO 12196, DOD Instruction 6055.1, AR 385-10, and AR 385-40. Where more stringent occupational health requirements are set forth in the AR 40 series, they will be applied to work by government

forces. Army regulations provide for health and safety programs that are at least as effective as OSHA programs.

3.3.8 RSA LAND USE AND AESTHETICS

This section describes the existing environment in terms of land use and aesthetics for the areas on and surrounding RSA. Topics addressed are regional land use, RSA land use, and aesthetics. The ROI for these resources include the RSA boundaries and potentially affected adjacent lands.

3.3.8.1 Regional Land Use

Top of Alabama Regional Council of Governments, Madison and Morgan counties, and the cities of Huntsville and Madison are the local planning authorities for incorporated and unincorporated areas around RSA. Morgan County, to the south of RSA, does not have any zoning in that part of the county and consists of mostly open areas, agriculture, and forested areas with scattered residential areas, with the closest residence located approximately 2.4 kilometers (1.5 miles) from the RSA boundary. Currently, land to the east and west is developed in light to moderate residential with some recreational and open areas. Dense residential areas are to the northwest and northeast. Industrial development occurs along the northern boundary, along with the U.S. Space and Rocket Center and some commercial areas. A sewage treatment plant is in close proximity to the east. Zoning, which indicates the likely long-term development patterns around RSA, is consistent with existing land patterns, with room for future growth. (Redstone Arsenal, 1989)

3.3.8.2 On-base Land Use

RSA encompasses an area of 15,342 hectares (37,910 acres) and is in the southwest section of Madison County (U.S. Army Missile Command, 1994). Within this area, the Army uses about 1,649 hectares (4,075 acres) under a permit agreement with the Wheeler National Wildlife Refuge. The Tennessee Valley Authority (TVA) also allows RSA to use approximately 1,176 hectares (2,095 acres) along the Tennessee River, under a land use permit (U.S. Army Missile Command, 1983). The remainder of the land was purchased between 1941 and 1942.

Land uses on RSA are broken down into ammunition supply, test and operations, administration, research and development, training areas, troop housing, community recreation, and family housing (figure 3.3.8-1). The NASA MSFC, other administration areas, and the research and development facilities are in the central section of RSA. Ammunition supply areas are located in the southern part of the installation, which primarily consists of vacant storage igloos. However, some of these igloos are still used for storage. Family and troop housing, and most community recreation are located in the northern part of RSA, with some recreation along the Tennessee River. Test and operations areas are on the western and central part of the base. Training areas are scattered throughout RSA.

EXPLANATION

- Test and Operations
- Training
- Airfield
- Ammunition Supply
- Administrative
- Commercial
- Residential
- Recreation
- Agriculture
- Industrial
- Water
- Open Space
- Interstate Roads
- U.S. Highways
- State Highways
- Railways
- Gate

Note: Gate 5 (Hansen Road) is currently inactive and secured.

Scale 1:100,000

0 .8 1.6 Miles

0 1.3 2.5 Kilometers

NORTH

Existing General Land Use on Redstone Arsenal and Surrounding Areas

Redstone Arsenal, Alabama

Figure 3.3.8-1

0035ltf

3.3.8.3 Aesthetics

The ROI for aesthetics for RSA includes the general visual environment surrounding RSA and the areas visible from off-base areas. The visual environment of RSA is characterized by the typical Tennessee Valley contrast between low mountains and agriculture. Much of the southern half of the installation is covered in forested wetlands (swampland). Topography is gently rolling, with elevations ranging from 169 meters (556 feet) at the Tennessee River up to 380 meters (1,240 feet) at Weeden and Madkin Mountains, with the primary range being 183 to 198 meters (600 to 650 feet) (U.S. Army Missile Command, 1994).

RSA is fairly undeveloped. The most significant aspect of the natural environment is the gentle rolling nature of the land and the densely forested areas and wetlands. The most significant man-made features are test, administrative, and housing areas in the northern portion of RSA. These features are surrounded with grassed and treed open spaces. The landscape is dominated by forested land, with the remaining land being in pasture, scrub shrub, and wetlands. The area has a relatively low visual sensitivity because the lack of relief and heavy vegetation limits any prominent vistas.

Since public access to RSA is restricted, viewpoints are limited to marine traffic on the Tennessee River, the Town of Triana to the southwest, Madison to the northwest, Huntsville to the northeast, and interstate traffic to the north.

3.3.9 RSA NOISE

For a general discussion of noise and the method of measurement used in this EA, see section 3.1.9.

Background Noise Levels off RSA

Several populated areas surround RSA: Huntsville borders on the east, north, and west; Madison on the west-northwest; Triana on the southwest; Mooresville on the west; Somerville on the southwest; Decatur on the west-southwest; Hartselle on the southwest; and Falkville on the south-southwest. The largest population densities adjacent to RSA are in Huntsville on the north and east boundaries and along the northwest portion of the installation boundary in Madison. The Huntsville International Airport and other commercial/industrial land uses, which are not considered to be noise sensitive, are located on the west side of RSA beyond developing residential areas. Isolated farm residences are in the area south of and across the Tennessee River from RSA. The Wheeler National Wildlife Refuge extends into large portions of RSA from the southwestern corner.

The City of Huntsville has adopted a noise ordinance (88-663) that regulates noise production by various sources and defines levels of ambient noise for several types of land use. Daytime noise levels are limited to 55 dBA in residential areas, 62 dBA in commercial areas, and 70 dBA in industrial areas. (National Aeronautics and Space Administration,

1996) Noise levels within the developed areas are typical of an urban environment ranging between 45 and 80 dBA.

Background Noise Levels on RSA

For undisturbed areas of MSFC, the background noise levels are reported to be 46 dBA. The major operational noise sources on RSA include rocket motor flight tests, static rocket motor firings, ordnance detonations, gun firing, airfield operations, and vehicle traffic. Most test areas are located on remote parts of RSA; therefore, noise generated by testing appears to have little impact on RSA and the surrounding community. Some weapons firings, small missile firings, and static missile firings can reach decibels at the test location of 150 dB. (National Aeronautics and Space Administration, 1996)

Noise complaints from activities at RSA are minimal because the noise producing activities at RSA are located so that a significant buffer exists between noise-producing activities and the nearest population center. RSA has conducted an Installation Compatible Use Zone (ICUZ) study showing minimal noise concerns outside of RSA boundaries.

3.3.10 RSA SOCIOECONOMICS

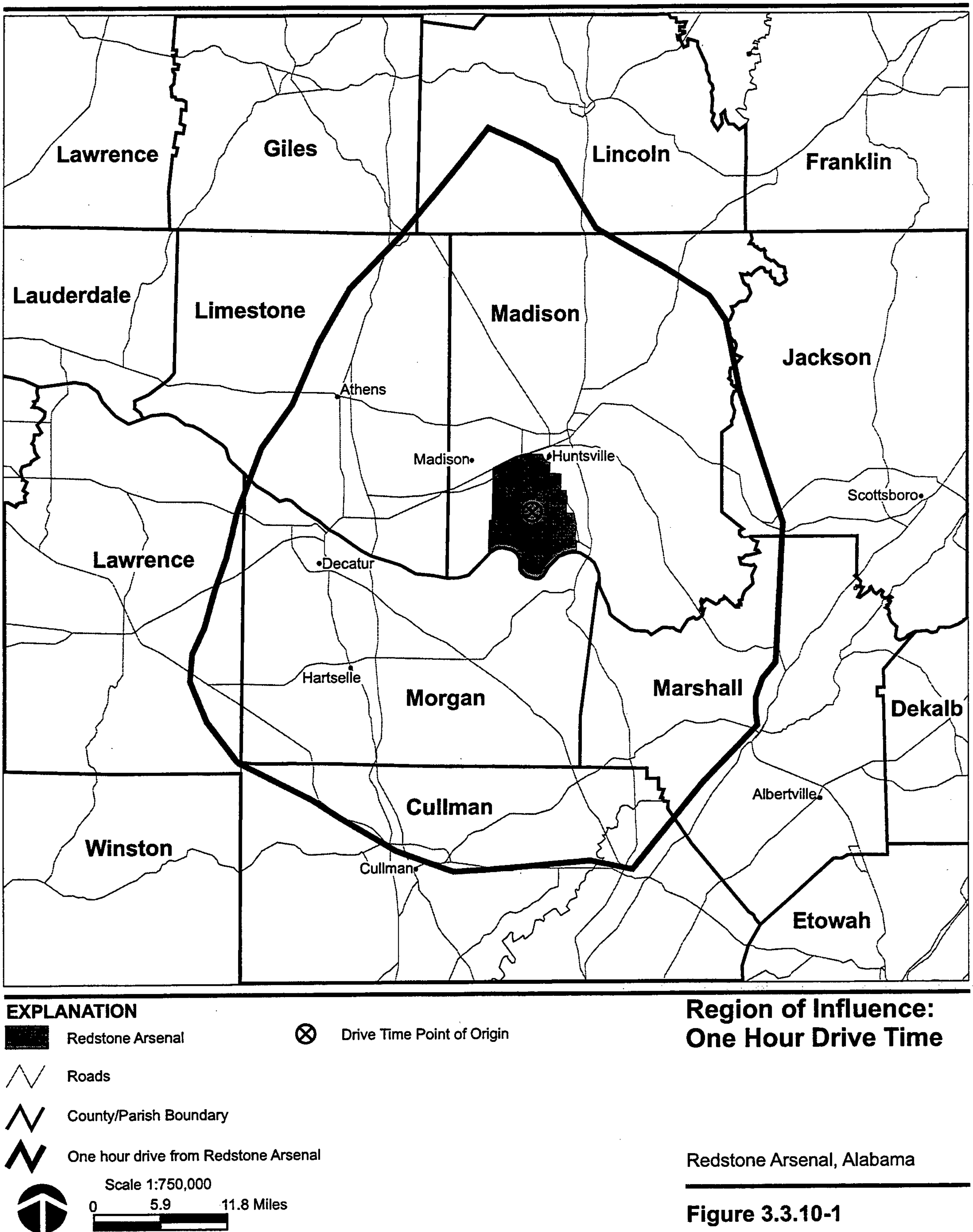
This section provides a socioeconomic overview of the region surrounding RSA. Socioeconomic resources are described in terms of population and employment.

3.3.10.1 Region of Influence

For the purposes of this analysis, the region surrounding RSA is defined as an area that includes those communities within approximately 1 hour's drive from the proposed test site. The drivetime is delineated by using a computer program that assumes a journey carried out within the legal speed limits and in moderate traffic densities. Figure 3.3.10-1 illustrates the extent of the region. While the drivetime polygon covers all or part of nine counties, four counties constitute the majority of the defined region. These four counties are Limestone, Madison, Marshall, and Morgan, and they include the communities of Huntsville, Decatur, Athens, and Hartselle.

Each of the four counties that compose the major part of the 60-minute drivetime rank within the top 20 most populated of 67 Alabama counties. Madison County, which contains Huntsville and RSA, had the third highest population in Alabama in 1995.

A little over 13 percent of Alabama's total personal income, or $10.8 billion, was generated in the four counties in 1995, the majority of this proportion being earned in Madison County.



Region of Influence: One Hour Drive Time

Redstone Arsenal, Alabama

Figure 3.3.10-1

3.3.10.2 Population

In 1997, there was a population of 469,563 within a 60-minute drive of the test site at RSA. This population is forecast to increase by 1.4 percent annually to 503,648 by 2002. A straight-line projection suggests that the population will grow to 525,276 by 2005. The fastest growing locations within this economic region are within a 30-minute drive of the test site.

Those referred to as economically active (age 18 and above) constitute about 75 percent of the regional population. Despite a discernible trend in the aging of the local population, this proportion remains constant through 2005. The median age of the region's population was 35.8 years in 1997 and is expected to rise to a little over 38 years of age by 2005.

3.3.10.3 Employment

Limestone, Madison, Marshall, and Morgan counties had 196,725 non-Federal jobs in 1993. Employment rose 4.3 percent to 205,319 jobs in 1995. If the forecast growth rate in jobs for the State of Alabama, as a whole, is applied to the four-county area, there would be approximately 227,000 jobs in the region by 2005.

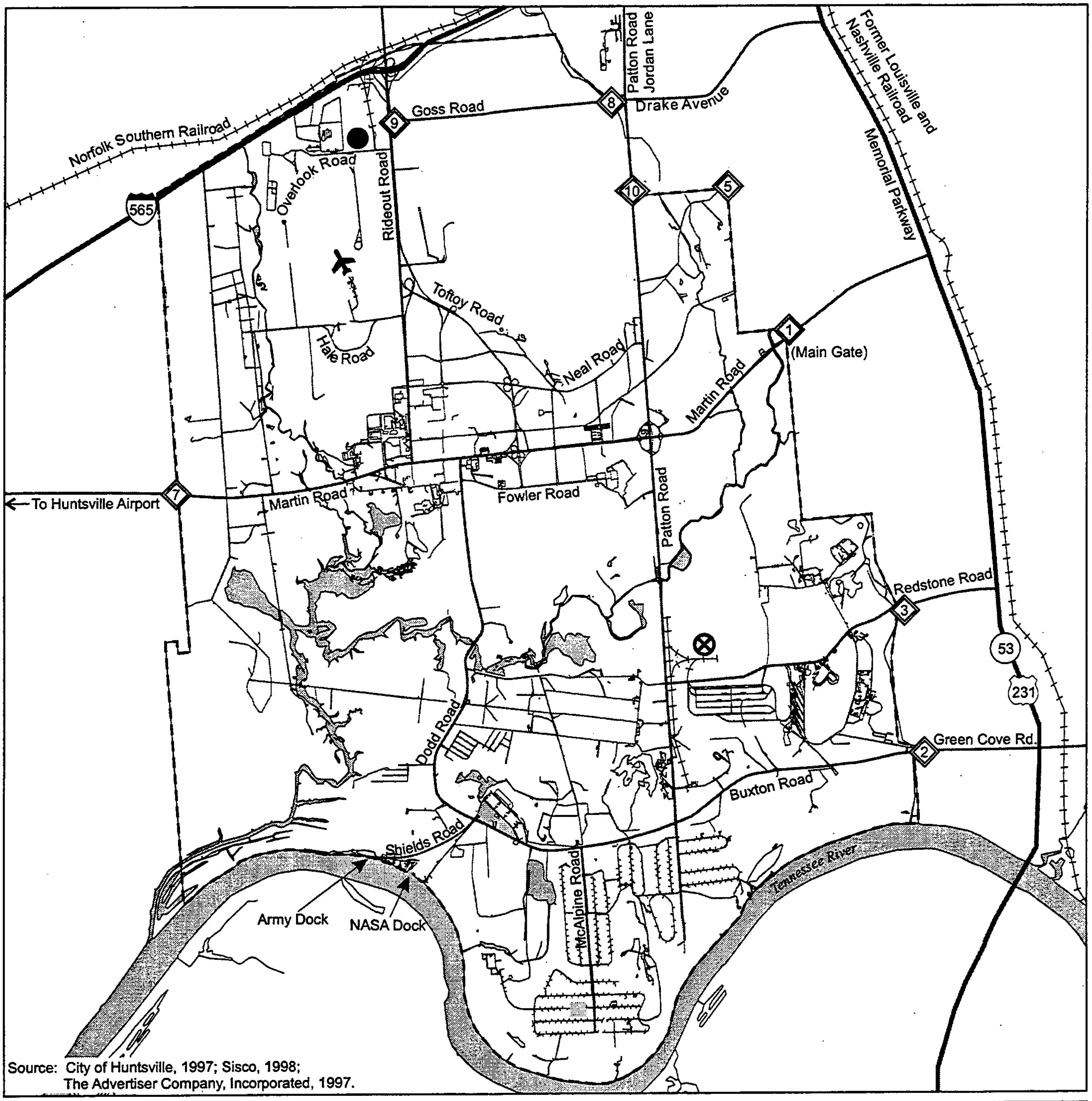
3.3.11 RSA TRANSPORTATION

The ROI for transportation potentially affected by the LTF program at RSA includes nearby Federal, state, and local roads. RSA is linked to this system by Rideout Road (State Highway [SH-] 255), Patton Road-Jordan Lane (SH-53), Drake Avenue, Martin Road, Redstone Road, and Green Cove. In addition, railroads, waterways, and airfields also serve RSA, forming an interrelated system that provides two primary functions: the means by which people and goods move into RSA and the means for internal circulation (Marshall Space Flight Center, Environmental Engineering and Management Office, 1997). Area rail, waterway, and airway networks are described below. The current AMCOM-MSFC support agreement, dated 8 January 1990, calls for AMCOM support of MSFC, including the use of the NASA Dock Area; security services, including traffic control and law enforcement within MSFC (Martin and Rideout Roads only); and transportation services and facilities, including roads, railroads, and airfields. In turn, MSFC agrees to support AMCOM through use of its roads and railroads. (Marshall Space Flight Center, Environmental Engineering and Management Office, 1997; Noles, 1999)

3.3.11.1 Roadways

Off-Installation Network

The main transportation corridors in the RSA vicinity are Memorial Parkway (SH-231), I-565, Governors Drive (SH-20/431), University Drive (US-72), Jordan Lane (SH-53), and Rideout Road (SH-255) (figure 3.3.11-1). A 6.4-kilometer (4-mile) extension of Rideout Road, linking US-72 West and SH-53, allows greater access between I-565 and northeast



EXPLANATION

- Roads
- Interstate Roads
- U.S. Highways
- State Highways
- Railways
- Railroad Classification Yard
- Rail Impact Facility
- Redstone Army Airfield
- Gate

Scale 1:100,000

0 .8 1.6 Miles

0 1.3 2.5 Kilometers

NORTH

Note: Gate 5 (Hansen Road) is currently inactive and secured.

Transportation Network

Redstone Arsenal, Alabama

Figure 3.3.11-1

Madison County (Huntsville/Madison County Chamber of Commerce, 1997). Access to I-65, approximately 24 kilometers (16 miles) west of RSA, is by way of US-72, -72A, and I-565, a 34-kilometer (21-mile) spur linking to downtown Huntsville and to RSA by Rideout Road and Jordan Lane. Urban roadways include Drake Avenue, entering RSA from the east; Governors Drive, which serves as a regional corridor through Huntsville; Green Cove, providing access to Gate 2; and Jordan Lane, providing direct access to Gate 8. Before entering gate 8, it becomes Patton Road, whereas north of the city, it becomes SH-53. Memorial Parkway, one of the city's major connectors, is a divided highway running through Huntsville east of RSA and linked to it by Drake Avenue, Martin Road, Redstone Road, and Green Cove. Another primary connector is University Drive.

Capacity analyses were conducted on the above roadways by the City of Huntsville in 1995 using 1992 traffic counts (City of Huntsville, 1997); these figures are adequate for current analysis (Sanders, 1998). The ADT and capacities for key roadways are shown in table 3.3.11-1. The most congested segment is Memorial Parkway, north of Redstone Road. This section, together with University Drive, carries most of the heavy volume. Alabama DOT projects traffic loads to exceed 100,000 vehicles per day by 2013 (U.S. Department of Agriculture, 1996)

On-installation Network

Currently, all traffic to and from RSA is routed through eight gates (Marshall Space Flight Center, Environmental Engineering and Management Office, 1997). The Hansen Road gate, at the northeast boundary, is permanently closed.

The principal RSA system configuration consists of north-south and east-west traffic (figure 3.3.11-1); major north-south elements are Rideout Road, Toftoy Thruway, and Patton Road. Major east-west elements include Martin Road (which will be widened to four lanes in 2003 or later) (Redstone Arsenal, 1999b), Goss Road, and Redstone Road (Marshall Space Flight Center, Environmental Engineering and Management Office, 1997).

Martin Road is an urban roadway providing access to RSA. During the morning peak hours, Martin Road, from Patton Road to Memorial Parkway, operates with both lanes inbound; during the afternoon peak hours, these same lanes are outbound. Patton Road connects RSA to Jordan Lane and I-565 on RSA's north end. Redstone Road provides access from South Memorial Parkway to RSA. Rideout Road is a limited-access highway that connects to Gate 9 at RSA's western end and provides access to I-565 and SH-53. It is a major access point to RSA for employees living in the Madison and Decatur areas, as well as communities north of Huntsville.

Table 3.3.11-1: Average Daily Traffic Volumes and Level of Service, Huntsville, Alabama

Roadway	Lanes	Direction	City/Roadway Links	Segment	Capacity (ADT) 1992	Traffic (ADT) 1996-97	
Off-installation							
I-565	6	E-W	I-65, Decatur	East of Rideout Road	136,000	71,200	
Drake Avenue (Gate 10)	4	E-W	Memorial Parkway	East of Jordan Lane	23,000	18,600	
Governors Drive	4	E-W	Memorial Parkway, I-565, Guntersville	West of Memorial Parkway	44,000	23,500	
Green Cove (Gate 2)	4	E-W	Memorial Parkway	West of Memorial Parkway	9,000	8,000	
Jordan Lane (Gates 8 and 10)	4	N-S		South of Bob Wallace	26,500	25,700	
Memorial Parkway	4	N-S	Fayetteville, TN, Arab, Meridianville	South of Martin Road	23,000	56,800	
University Drive	6	E-W	Rideout Road	West of Jordan Lane	48,000	46,100	
On-installation [2]							LOS
Buxton Road	2	E-W	So. Memorial Parkway		-	-	A/B
Goss Road (Gate 8)	4/2	E-W	Drake Avenue	See Drake Avenue		15,625	E[1]
Martin Road (Gate 1, 7)	2	E-W	Memorial Parkway, Madison	West of Memorial Parkway	14,000	11,000	D-East; C-West[1] A-B/D
Patton Road (Gate 10)	4	N-S	Jordan Lane, SH-53, Drake Avenue	South of Drake Avenue	26,500	13,300	A-B/D
Redstone Road (Gate 3)	2	E-W	Memorial Parkway	West of Memorial Parkway	11,500	5,600	B
Rideout Road (Gate 9)	4	N-S	Madison, Decatur, I-565, SH-53	North of I-565	50,000	36,200	A-B/D

Source: City of Huntsville, 1997; Marshall Space Flight Center, Environmental Engineering and Management Office, 1997; Noles, 1998; State of Alabama, 1997.

[1] Per 1993 capacity rates

[2] All RSA roads of asphaltic concrete; primary road lanes are typically 3.4 to 3.7 meters (11 to 12 feet) in width.

ADT – Average Daily Traffic

LOS – Level of Service

A – The highest quality of service a highway can provide; free flow with little or no restrictions on speed or maneuverability from other vehicles.

B – A zone of stable flow, though operating speed is beginning to be restricted by other traffic

C – A zone of stable flow, though most drivers are restricted in freedom to select speed, change lanes, or pass.

D – Approaching unstable flow; tolerable operating speeds subject to considerable, sudden variation, low maneuverability and driving comfort.

E – Upper limit is "capacity"; operation is unstable, driving comfort, speed selection and maneuverability low; accident potential high.

F – Forced-flow operations. Density increased; arrival rate exceeds discharge rate; speed and flow may, for short periods, drop to zero.

3.3.11.2 Waterways

Off-installation Facilities

Huntsville's proximity to the Tennessee River and the Tennessee-Tombigbee (Tenn-Tom) Waterway allows direct shipment along 25,750 kilometers (16,000 miles) of inland waters via river barge (Huntsville/Madison County Chamber of Commerce, 1997). Nearby ports include the Port of Decatur and Mallard-Fox Creek Industrial Park. In 1996, Decatur handled 2.7 million metric tons (3.0 million tons) of commodity traffic. Tennessee River and Decatur traffic can be estimated from vessels processed at the Wheeler and Guntersville locks: in 1997, 3,223 tows and 25,084 barges traveled those areas (Riberich, 1998). Mallard-Fox Creek, a general commodity dock, can accommodate eight barges (Huntsville Foreign Trade Zone Corporation, 1998).

On-installation Facilities

Water transportation on RSA (located adjacent to the Tennessee River) was developed since distances between manufacturing, static testing, and launch sites, as well as cargo size, weight, and sensitivity, might preclude alternate transport (Marshall Space Flight Center, Environmental Engineering and Management Office, 1997). There are two slips on Shields Road: the Army dock, unused since around World War II, and the MSFC dock, which has a recess for roll-on and roll-off loading and unloading. MSFC has overall responsibility for all special water transportation of shuttle components and related cargo between ports and as such, must monitor cargo loading, unloading, and in-transit care of the barges (U.S. Department of the Air Force and National Aeronautics and Space Administration, 1993). MSFC's Marine Operations (Transportation Management Division) allows transport of large items via the "Orion," an 80.8-meter (265-foot) river/ocean covered barge with a 907-metric ton (1,000-ton) cargo capacity and available electric power for specialized cargo (National Aeronautics and Space Administration/Marshall Space Flight Center Transportation Management Services, 1997). Another covered river-ocean barge, the "Poseidon," is also available, as is an open-shuttle barge, the "Pearl River," both of comparable size to the Orion. The homeport is New Orleans' Michoud Assembly facility. (Marshall Space Flight Center, Environmental Engineering and Management Office, 1997; Welch, 1998)

The distance from the LTF site to the dock is 6.1 kilometers (3.8 miles). The RSA barge-loading dock, as well as a supporting road system capable of handling heavy cargo, allow direct access to deep-water via the Tenn-Tom and the Tennessee/Ohio/Mississippi River System (National Aeronautics and Space Administration, 1997b). If barge transport on the Tenn-Tom (the suggested route for LTF activities) is disrupted in late winter/early spring, it can be compensated for by re-routing traffic up the latter system and south to the Gulf of Mexico, thus avoiding flood conditions entirely. Vessel height restrictions of 15.2 meters (50 feet) or less (due to bridge clearances) may also mandate the alternate route.

3.3.11.3 Railways

Off-installation Facilities

Railway services, provided by Norfolk Southern Railway and the Huntsville/Madison County Railroad Authority (operating over CSX's former Louisville and Nashville tracks), are currently designated for freight shipments only (Huntsville/Madison County Chamber of Commerce, 1997). Huntsville has no passenger rail service (Huntsville OnLine, undated).

On-installation Facilities

By 1973, RSA railway use diminished, as alternate shipping methods increased (Marshall Space Flight Center, Environmental Engineering and Management Office, 1997). Most track was removed, leaving only two small sections. A railhead with a seven-track spur less than 1.6 kilometers (1 mile) in length, located on Overlook Road near the north boundary, has been retained to serve MSFC as needed (U.S. Department of the Air Force and National Aeronautics and Space Administration, 1993). Another section, 2.3 kilometers (1.4 miles) in length, lies northeast of the Patton-Redstone roads intersection and is utilized as the Redstone Rail Impact Test Facility. The former is the Norfolk Southern Railway Classification Yard and joins the main line just north of Gate 9. The latter is isolated, with no access to off-post railways (U.S. Army Missile Command, 1983), and terminates at Sheffield Road. AMCOM retains right of access to all railroad tracks for operation, maintenance, and modification purposes (Marshall Space Flight Center, Environmental Engineering and Management Office, 1997; Noles, 1999).

3.3.11.4 Airways

Off-installation Facilities

Huntsville International Airport and Huntsville-Madison County Jetplex are located approximately 13 kilometers (8 miles) west of RSA, allowing simultaneous operations via two parallel runways (National Aeronautics and Space Administration, 1997b) and five major and commuter airlines (table 3.3.11-2). Assisting in Huntsville International Airport's efficiency are state-of-the-art facilities and the International Intermodal Air Cargo Center, a large terminal assisting the transport of shipments from truck to air and vice-versa. (Huntsville/Madison County Chamber of Commerce, 1997) Other features include Foreign Trade Zone No. 83 and a U.S. Customs Port of Entry. Several small, private airports are also located in the Huntsville metro area (Huntsville OnLine, undated).

On-installation Facilities

As needed, AMCOM–controlled Redstone Army Airfield is used for bringing components into RSA for test and integration. This runway can accommodate 747s and C-5 transports (Fine, 1998) and is used by both military and civil aircraft, although NASA and civilian aircraft require special advance permission. In emergencies, RSA and Huntsville International Airport airway facilities can be used on an interim, reciprocal basis. (Marshall Space Flight Center, Environmental Engineering and Management Office, 1997).

Table 3.3.11-2: Redstone Arsenal Available Airway Facilities

Airport/Airfield	Runways in meters (feet)	Commercial Operations	General Aviation Operations	Flights
Off-installation				
Huntsville International	West - 2,438 (8,000); East - 3,048 (10,000)	26,816/annually	30,107/annually	80/day
On-installation				
Redstone Army Airfield	2,225 (7,300) length; 45.7 (150) width	Civil aircraft >600 arrivals-departures/month	N/A	600/month [1]

Source: Fine, 1998; National Aeronautics and Space Administration, 1997b; National Resources Defense Council, Inc., 1996; U.S. Department of the Air Force and National Aeronautics and Space Administration, 1993.
[1] Approximately 35 percent of RSA traffic is NASA or NASA-related flights. With added personnel and shifts, RSA has the capability to double operations (U.S. Department of the Army, 1996).

3.3.12 RSA UTILITIES

The ROI for utilities includes all or portions of the service areas of each utility provider serving RSA and local communities. On RSA, the Army has granted NASA full control and responsibility for its land and facilities with certain exceptions, retaining right of access to all major utility lines for operating, maintaining, modifying, and extending such utilities. The current agreement calls for AMCOM support of MSFC via electric power, water, steam, sewage disposal, and sanitary landfill services. (Marshall Space Flight Center, Environmental Engineering and Management Office, 1997)

3.3.12.1 Water Supply

Off-installation

The City of Huntsville/Madison County Water Department water supply is from both wells and the Tennessee River. This system serves Huntsville, as well as wholesaling water to the City of Madison, Madison County, and RSA. The water quantity and quality is satisfactory for current uses (Dornbos, 1998). Huntsville presently has a capacity of 246 million liters (65 million gallons) of potable water per day with a maximum peak demand of 231 million liters (61 million gallons) per day; however, an expansion at the south plant should begin in October 1999, providing approximately another 68 million liters (18 million gallons) per day (Bolton, 1999). The City of Madison obtains its water from three wells and one encapsulated spring (Dublin Spring), and maintains interconnections with Huntsville, Limestone County, and Harvest-Monrovia water systems. From 1986-1990, water demand increased by 23 percent (Geological Survey of Alabama, 1992). In 1997, total consumption was 4,276 million liters (1,130 million gallons) (Taylor, J., 1998).

On-installation

RSA operates separate potable and industrial water supply systems, with potable water acquired from the Tennessee River (EDAW, Inc., 1998c) and treated at one of three active

WTPs. The primary WTP, No. 1, produces both domestic and industrial water; No. 2 is a generally inactive auxiliary industrial water source; No. 3 treats industrial water to produce higher quality domestic water (Marshall Space Flight Center, Environmental Engineering and Management Office, 1997; U.S. Army Missile Command, 1994). The plants have a combined capacity to deliver 34 million liters (9 million gallons) of potable water per day, with the average daily consumption of 19 million liters (5 million gallons) and a peak demand of 30 million liters (8 million gallons) per day (Redstone Arsenal, 1998a).

The industrial nonpotable water, obtained primarily from wells near the Visitor Control Building and Test Area 3, supplies restrooms and maintenance activities. The system can deliver over 129 million liters (34 million gallons) per day, with daily demand averaging between 44 million liters (12 million gallons) in the summer and 31 million liters (8 million gallons) in the winter; peak daily demands are 58 million liters (15 million gallons) and 48 million liters (13 million gallons), respectively (Redstone Arsenal, 1998a). RSA stores 6 million liters (1.7 million gallons) of potable water and 33 million liters (9 million gallons) of industrial water. During emergencies, RSA can acquire 3.8 million liters (1 million gallons) of potable water per day from the City of Huntsville.

WTP 1 is located near the proposed LTF site and currently runs at 50 to 60 percent capacity. It has the capability to serve 800 additional personnel, due to recent downsizing. Water is available at Building 8027. (EDAW, Inc., 1998c)

3.3.12.2 Wastewater

Off-installation

The City of Huntsville provides secondary treatment for Huntsville, Madison, and other nearby communities. In unincorporated areas of Madison County and in smaller towns in the RSA vicinity, domestic wastewater is treated via septic tanks. The city has six WWTPs with permitted capacities and average daily demand as listed in table 3.3.12-1.

Table 3.3.12-1: Huntsville WWTP Capacities

WWTP	Permitted Capacity - million liters (million gallons) per day	Average Daily Demand - million liters (million gallons) per day
Spring	155.2 (41.0)	86.5 (22.85)
Aldrich Creek	31.8 (8.4)	21.2 (5.6)
Western Area	56.8 (15.0)	36.5 (9.65)
Chase	15.1 (4.0)	2.9 (0.77)
Big Cove	8.3 (2.2)	0.79 (0.21)
Knox Creek	0.28 (0.075)	0.27 (0.071)

Source: Lyda, 1998.

On-installation

General RSA wastewater is treated at the Centralized WWTP, Domestic Treatment and Collection System 3, with a designed average capacity of 13.6 million liters (3.6 million gallons) per day. The peak 2-hour capacity is 34 million liters (9.0 million gallons) per day (Eubank, 1998b), and the peak 24-hour capacity is 22.7 million liters (6.0 million gallons) per day (Redstone Arsenal, 1998a). The average flow rate of the plant is 9.1 million liters (2.4 million gallons) per day, with a peak demand of 34.1 million liters (9.0 million gallons) per day. A potential increase in capacity of 1.1 million liters (0.3 million gallons) per day, average, and 3.8 million liters (1.0 million gallons) per day, peak, could result from a tie-in with the City of Huntsville system. (Redstone Arsenal, 1998a) For 1997, during periods of wet weather, the average flow was 17 million liters (4.5 million gallons) per day (Eubank, 1998b). Effluent discharges to the Tennessee River under RSA's current NPDES permit.

The WWTP at the Buxton-Shields intersection has a 22.7 million-liter (6.0 million-gallon) per day capacity and a current daily load of 10.6 million liters (2.80 million gallons).

3.3.12.3 Solid Waste

Off-installation

Since 1990, the City of Huntsville Solid Waste Disposal Authority has operated a Waste-to-Energy plant, which has an estimated capacity of 626 metric tons (690 tons) per day with a current daily demand of approximately 590 metric tons (650 tons). Figures for 1997 indicate the plant received 168,705 metric tons (185,965 tons) of solid waste, producing 181,437 kilograms (400,000 pounds) per hour of steam (Harrison, 1998). The plant disposes of the resultant ash in its ash monofill. In 1997, the plant produced 48,401 metric tons (53,353 tons) of ash (Harrison, 1998), a rate that will fill the monofill in approximately 7-plus years. In addition to the monofill, the city operates a municipal landfill with a remaining life of 10 years and a construction and demolition materials landfill with a remaining life of 15 years (Coker, 1997; Harrison, 1998).

On-installation

RSA operates a 30.8-hectare (76.0-acre) landfill for disposal of inert waste (rocks, construction materials, asphalt, and asbestos). The Army has applied to ADEM for a permit modification to increase the allowable disposal area from 16.9 to 17.5 hectares (41.8 to 43.3 acres). This modification would not affect the types of waste allowed, its service area, or its maximum daily volume. The landfill would still be allowed to accept only construction/demolition debris or similar wastes from within the RSA reservation at 459 cubic meters (600 cubic yards) per day. ADEM's preliminary determination indicates the proposed modification would satisfy all applicable regulations. At current rates of use, it is expected to reach capacity in 15 to 25 years. (Alabama Department of Environmental Management, 1997)

Most RSA/MSFC-generated solid waste is disposed of daily. RSA and MSFC dispose of roughly 28,576 kilograms (31.5 tons) of waste at Huntsville's Waste-to-Energy facility

daily (Eubank, 1998b). In 1997, RSA disposed of 8.71 million kilograms (9,600 tons) of solid waste offsite, of which only a small portion was construction debris (Harrison, 1998).

3.3.12.4 Energy

Electrical—Off-installation

TVA provides electricity to municipally owned Huntsville Utilities, as well as to local utility companies throughout the Tennessee Valley (Huntsville OnLine, undated). Huntsville Utilities serves Madison and Morgan counties with a system of sufficient capacity to accommodate regional growth for approximately 10 years (Clark, 1997). In 1996, eleven substation projects were initiated and 1,490 new customers added (Huntsville Utilities, 1997).

Electrical—On-installation

Electrical services to RSA are also provided by TVA, with a system composed of three subsystems—a transmission, a subtransmission, and a distribution system. The primary supply is obtained from TVA's 161-kV, 3-phase transmission systems; the part to which RSA is connected is supplied by three separate 161-kV generating stations: the Wheeler Dam (including the Browns Ferry Nuclear Plant); and Guntersville Dam stations, which normally supply power to RSA, and the Widow's Creek Steam Generating Plant. The 161-kV transmission lines are transformed to a 44-kV, 3-phase subtransmission level by three government-owned primary substations. (Marshall Space Flight Center, Environmental Engineering and Management Office, 1997) Plans are underway for as many as 13 future substation units (Redstone Arsenal, 1998a).

RSA has access to a 182,108-kilovolt-ampere (kVA) electrical supply, with an average daily use of about 52,900 to 75,500 kVA and peak demand of approximately 80,000 kVA (Redstone Arsenal, 1998a), or less than 44 percent of available capacity. MSFC also has approximately 1,800-kVA total capacity through several emergency generators for critical or special electrical circuits (Marshall Space Flight Center, Environmental Engineering and Management Office, 1997). The RSA electricity demand for FY98 averaged approximately 34.4 million kWh per month (Lusk, 1999b).

Natural Gas—Off-installation

Natural gas is supplied to city and county areas by Huntsville Utilities/North Alabama Gas; 1996 figures indicate that 34,202 Huntsville area customers (generally confined within city limits) are served (Huntsville Utilities, 1997). The Huntsville Utilities Gas Board approved a proposal with the Southern Natural Gas Pipeline of Birmingham to increase capacity by an additional 1.13 million cubic meters (40 million cubic feet) per day (Huntsville Utilities, 1997) by November 1999 (Boyett, 1998). This amounts to an increased capacity by 400,000 therms. In 1998, natural gas demand reached 65 million therms (Huntsville Utilities, 1999); Huntsville has firm transport available for up to 159 million therms (Dement, 1999).

Natural Gas—On-installation

Natural gas for RSA is obtained through Huntsville Utilities at two locations: Goss Road, for firm consumption, and Patton Road, for interruptible (Eubank, 1998a; b). Natural gas is routed through MSFC at 3 kilograms per square centimeter (45 pounds per square inch), but its primary purpose is to serve the Army-operated boiler plant. (Marshall Space Flight Center, Environmental Engineering and Management Office, 1997) RSA's average usage has been approximately 27 million cubic meters (960 million cubic feet) per day (Eubank, 1998b), or 9,600,000 therms. However, now that RSA receives steam directly from the city and has closed down its own two steam plants, its gas use has dropped markedly (Eubank, 1998a). Figures for 1995 through 1998 show a drop from 12.3 million cubic meters (434.1 million cubic feet) to 6.93 million cubic meters (244.88 million cubic feet), or 2,448,823 therms, a drop of 43.6 percent (Lusk, 1999a).

3.3.13 RSA WATER RESOURCES

This section provides an overview of the surface and groundwater features, water quality, and flood hazard areas in the vicinity of RSA, Alabama. In general, the ROI for groundwater is the local aquifers that are directly or indirectly used by RSA. The ROI for surface water is the drainage system/watershed in which RSA is located. ADEM is responsible for the management of the NPDES permit process.

3.3.13.1 Groundwater

The hydrology at RSA can be characterized by three units: the regolith, the Tuscumbia Limestone and Fort Payne Chert, and the Chattanooga Shale. The Tuscumbia limestone and Fort Payne Chert compose the limestone aquifer. The upper regolith and the Chattanooga Shale, because they are relatively impermeable, act as the confining units for the limestone aquifer. Water in the lower layers of the regolith, by contrast, occurs under water table conditions. Groundwater movement reflects the topography and is generally from north to south toward the Tennessee River. In the vicinity of the PTC Complex the water movement is to the north and then west toward the Tennessee River. Groundwater in both the limestone aquifer and the water table aquifer moves to lowland areas in the stream basin where it provides a base flow to the streams. The aquifers beneath RSA are some of the most productive in Madison County. None of the aquifers in Madison County have been designated as sole principal drinking water sources under Section 1424(2)g of the Safe Drinking Water Act of 1974 (U.S. Army Missile Command, 1994).

3.3.13.2 Surface Water

The Tennessee River, flowing west, forms the southern boundary of RSA. Other major water courses that flow through RSA include Indian Creek, Huntsville Spring Branch, and McDonald Creek. Each of these tributaries generally flows south and empties into the Tennessee River.

The western portion of RSA drains into Indian Creek, and the eastern half drains into Huntsville Spring Branch. Indian Creek originates in the northwestern portion of Madison County, flows southward across RSA, and forms an arm of Wheeler Lake. Indian Creek drains the Wheeler Lake and joins the Tennessee River at Wheeler Reservoir near the southwestern boundary of RSA. McDonald Creek runs along the eastern boundary of RSA and drains the northeastern corner of the installation before joining Huntsville Spring Branch. Huntsville Spring Branch originates at a spring in the City of Huntsville, flows in a southwesterly direction across RSA, and empties into Wheeler Lake (U.S. Army Missile Command, 1994).

Storm water is discharged (under site-wide NPDES permits) to McDonald Creek, Huntsville Spring Branch, and Indian Creek as they cross RSA to the Tennessee River. South RSA drains directly into the river. Since 1992, only two non-complying discharges have been reported, both short-term events resulting from unusually heavy rainfall.

3.3.13.3 Special Flood Hazard Areas

Special Flood Hazard Areas are defined as areas with a 1 percent or greater chance of equaling or exceeding an established flood level in any given year. Such areas are typically referred to as floodplains. AR 200-1, *Environmental Protection and Enhancement*, requires Army officials to protect floodplains from Army actions.

Approximately one-third of the installation lies within the 100-year floodplain of the Tennessee River. These areas include most of the Wheeler National Wildlife Refuge, several creeks and ponds, and the Tennessee River Banks. The 100-year floodplain lies at elevations ranging from approximately 174 to 175 meters (570 to 575 feet) above msl on RSA. For planning purposes, the 100-year flood level of the Tennessee River is established at approximately 175 meters (572.5 feet) above msl. Much of the southern part of RSA is topographically below this elevation and within a 100-year floodplain (Redstone Arsenal, 1998a). The proposed LTF sites are not located within the 100-year floodplain (EDAW, Inc., 1998c).

3.3.13.4 Water Quality

There is the potential for groundwater contamination at RSA as a result of past waste handling and generation activities, including the manufacture of chemical weapons and testing of rocket motors. Numerous groundwater investigations are in progress or planned to aid in the identification and remediation of contaminated waste sites under RSA. Where identified, groundwater contamination is being monitored at test wells located across the installation as part of the IRP. The Army has initiated groundwater remediation on several sites and expects complete cleanup to take 10 to 20 years (U.S. Army Missile Command, 1994).

Installation staff periodically sample and test water quality at several RSA locations on the Indian Creek and Huntsville Spring branches. Surface water quality is generally characterized as "moderately hard" to "hard", moderately high in dissolved solids, and

high in manganese. Area surface waters, including Indian Creek, Huntsville Spring Branch, and McDonald Creek, are generally suitable for most uses and are classified by ADEM as suitable for fish and wildlife use. The Tennessee River reach adjacent to RSA has been classified for use as a public water supply and for fish and wildlife uses (U.S. Army Missile Command, 1994).

3.3.14 RSA ENVIRONMENTAL JUSTICE

For a description of EO 12898 and the methodology used for this analysis, see section 3.1.14.

A census tract is considered disproportionate under either of these two conditions: (1) the percentage of persons in low-income or minority populations in the census tracts exceeds the percentage in Madison and Morgan counties, the region of comparison, or (2) the percentage of low-income or minority populations in the census tracts exceeds 50 percent. Data for each census tract were compared to data for the regional political jurisdiction surrounding the tract. For this analysis, the region of comparison RSA was defined as Madison and Morgan counties. Therefore, Madison and Morgan counties were used as the ROI for the environmental justice analysis. Based on the 1990 Census of Population and Housing, Madison County had a population of 238,912. Of that total, 25,289 persons, or 10.85 percent, were low-income, and 56,002 persons, or 23.44 percent, were minority. Morgan County had a population of 100,043. Of that total, 11,285 persons, or 12.03 percent, were low-income, and 11,101 persons, or 11.10 percent, were minority.

Madison County is subdivided into 63 census tracts, of which 34 have a disproportionate percentage of low-income or minority populations (or both). Morgan County is subdivided into 24 census tracts, of which 11 have a disproportionate percentage of low-income or minority populations (or both). These census tracts have been determined to have disproportionate low-income and/or minority populations, and therefore may be subject to environmental justice impacts.

3.4 STENNIS SPACE CENTER

The following sections discuss the affected environment or baseline conditions at SSC. This discussion includes the locations proposed for use by the LTF program as well as adjacent areas that have the potential to be impacted by program activities.

3.4.1 SSC AIR QUALITY

A general overview of the air quality resource is presented in section 3.1.1. Applicable Federal and state regulations are presented in appendix C.

3.4.1.1 Meteorology

The climate at SSC is typically temperate and rainy with hot summers. The average annual temperature is approximately 19°C (66°F), with a winter average of 12°C (53°F) and a summer average of 18°C (64°F). During the June through August period, temperatures will normally exceed 35°C (95°F) on more than half the days. A relative humidity greater than 70 percent is also normal during the same time frame.

Fog is a frequent occurrence from mid-October to May, with heavy fog limiting ground visibility to 0.40 kilometer (0.25 mile) or less an average of 42 days annually.

Rainfall averages approximately 150 centimeters (60 inches) per year, but this average varies by up to approximately 50 centimeters (20 inches) in any given year. There is no period specifically definable as a wet season, but July and August are typically the wettest months and October is normally the driest.

Surface winds normally blow from the south and southeast approximately two-thirds of the year, and predominantly from the north the remainder. Upper level winds generally prevail from the west and southwest. Hurricanes normally form during the June through November timeframe. The Gulf coast averages one tropical cyclone per year, approximately two-thirds of which are of hurricane strength (winds in excess of 120 kilometers per hour [75 miles per hour]). However, only a fraction of the hurricanes that enter the Gulf actually cause damage to the coast (through tidal surge or storm landfall). (National Aeronautics and Space Administration, 1997d)

3.4.1.2 Regional Air Quality

All areas in Mississippi are either in attainment or undefinable for all NAAQS and state AAQS. There are no mandatory Federal Class I areas in the vicinity of SSC. Emissions at SSC are monitored and restricted as applicable by SSC's Title V Air Permit. SSC operates in compliance with all requirements for Federal and state emissions regulations. (National Aeronautics and Space Administration, 1997d)

3.4.1.3 Air Emissions Sources

As of September 1997, SSC operated under three air pollution control permits. However, a Title V Air Permit application was submitted in June 1995, and final approval is pending. This permit will consolidate the three control permits and cover all stationary emissions sources on SSC.

Potential stationary sources of criteria pollutant and hazardous air pollutant emissions at SSC include several generators and backup generators, boilers, flare systems for testing engine components, machine shops, and fabrication facilities. In addition, limited amounts of chlorofluorocarbons are still in use as refrigerants or cleaners. Refrigeration units are being replaced, retrofitted, or recharged from existing stocks of chlorofluorocarbons pending the end of the unit's service life. Since 1993, SSC has reduced its use of chlorofluorocarbons and methyl chloroform (cleaner) and terminated its use of Halon. (National Aeronautics and Space Administration, 1997d)

The MSAAP is not included in the SSC Title V Air Permit. The MSAAP is operated in compliance with a separate Synthetic Minor Operating Permit. Air emissions are regulated well below the permitted limits. Typical sources include natural gas space heaters and boilers, and diesel and propane emergency generators.

3.4.2 SSC AIRSPACE

A general description of the airspace resource is provided in section 3.1.2.

Affected Environment at SSC

The affected environment is defined by the obstruction standards listed on the Obstruction Evaluation Worksheet (FAA Form 7460-6). This worksheet identifies criteria to determine if a structure would be an obstruction to navigable airspace. The first set of criteria is used to determine if a structure exceeds the notice criteria requiring a notice to be filed:

- Structure more than 61 meters (200 feet) AGL
- Structure exceeds a slope from an airport—100 to 1 for a distance of 6.1 kilometers (3.8 miles) from a runway of more than 975 meters (3,200 feet) in length

The second set of criteria is used to determine if the structure exceeds the obstruction standards. The potentially applicable criteria for SSC, Part IV subparts 77.23 (a) (2), "Application of Obstruction Standards," will be used to determine if any LTF facilities are an obstruction to an airport.

The nearest charted airport is Stennis International, located 15.6 kilometers (9.7 miles) east of the proposed I&T Complex and 14.6 kilometers (9.1 miles) east of the proposed PTC Complex. A new airport, not currently charted, is located approximately 9.9 kilometers

(6.2 miles) northwest of the proposed I&T Complex and 9.5 kilometers (5.9 miles) northwest of the proposed PTC Complex (Mississippi Army Ammunition Plant, 1999a). Stennis International, elevation 7 meters (23 feet), and the new Picayune Airport, elevation 16 meters (53 feet), will be used for the airport obstruction standards criteria application. Existing obstructions in the vicinity of SSC include elevations of 133 meters (436 feet) msl, 108 meters (353 feet) msl, and 119 meters (390 feet) msl. (National Ocean Service, 1999c)

The airspace above the proposed I&T and PTC Complexes at SSC is uncontrolled airspace. There is restricted airspace R-4403 located above the southern portion of SSC. The R-4403 airspace is managed by the Houston Air Route Traffic Control Center. The altitude for R-4403 is from surface to 1,524 meters (5,000 feet), and time of use is continuous. (National Ocean Service, 1999c)

3.4.3 SSC BIOLOGICAL RESOURCES

A description of biological resources is presented in section 3.1.3. The ROI for biological resources on SSC includes areas that may be affected by project activities, such as construction, noise, and human presence.

3.4.3.1 Vegetation

Four major plant communities have been documented within SSC. Pine savanna is the major vegetation type located in uncleared portions of the installation and the surrounding Buffer Zone. Slash pine is the dominant species within this community. Other common species include cypress, loblolly pine, swamp tupelo, red maple, oak, and sweet gum. The underbrush is composed of species such as holly, bayberry, huckleberry, wax myrtle, grasses, and cane. Bottomland hardwood occurs in low, poorly drained soils. The dominant species include black gum, swamp tupelo, and cypress. Underbrush species include ash, dogwood, leatherwood, Virginia willow, poison ivy, honeysuckle, and grapes. (Stennis Space Center, 1997a)

Pitcher plant bogs and swamps are unique to the southeast coastal plains and are found in low-lying, poorly drained areas with acidic soils on SSC. Mature trees in this community, if present, are cypress species. Other dominant species include orchids, sundews, pitcher plants, pipeworts, and yellow-eyed grass. Grasslands occur often in areas where land has been cleared for construction or burned. The most common grass species include broomsedges and panic grasses. Pipeworts, milkworts, and sedges may occur in low, wet areas. Rabbit tobacco and goldenrod may be found in drier grasslands. (Stennis Space Center, 1997a)

Forested cover including pine, cypress-gum swamps, mixed pine and hardwoods, and bottomland hardwoods dominates the western portion of SSC. Common species include loblolly, longleaf, and slash pines; black, willow, water, southern red, post, and laurel oaks; black and sweet gums; hickories; and tulip trees. (Stennis Space Center, 1997a)

Most of the MSAAP land is dominated by pine flatwoods. Mixed hardwood species such as tupelo, red maple, and pond cypress are found in drainage spots. Shrub species include holly, sweet bay, and wax myrtle. Many grass and rush species are also in the area. (U.S. Department of the Army, 1976; Headquarters, U.S. Army Armament, Munitions and Chemical Compound, 1990)

3.4.3.2 Wildlife

Aquatic wildlife on the installation includes fish, amphibians, and reptiles. Spotted gar, threadfin shad, and longear sunfish are sport fish found in Mike's River west of the MSAAP. Pirate perch, banded pygmy sunfish, flyer, lake chubsucker, grass pickerel, green sunfish, and black bullhead were found only in Wolf Branch or Lion Branch during a 1995 ecological survey. Several species of frogs, salamanders, turtles, and snakes occur in aquatic environments on the installation. (Stennis Space Center, 1997a)

A total of 22 terrestrial amphibians was documented in the Western Fee Area (the main part of the complex) during surveys performed in 1994 and 1995. Green frogs, tree frogs, spring peepers, bullfrogs, longtail salamanders, and dwarf salamanders are some of the species documented during these surveys. Thirty-three terrestrial and aquatic reptiles have been identified in the Western Fee Area. Surveys conducted in 1991 and 1994 documented 14 species of snakes, 6 lizards, and the alligator. Black racer, black rat snake, cottonmouth, fence lizard, and green anole were some of the species observed. (Stennis Space Center, 1997a)

Between 25 and 34 species of mammals have been documented in the Western Fee Area. White-tailed deer, muskrat, raccoon, bobcat, coyote, opossum, squirrels, skunk, and red fox are some of the mammals that have been identified. A large number of birds also nest and forage in the Western Fee Area. Herons, egrets, ducks, grebes, northern bobwhites, osprey, and woodpeckers are some of the birds that nest on the installation. (Stennis Space Center, 1997a)

A diverse population of mammals, birds, and reptiles inhabit the MSAAP area. White-tailed deer, squirrel, eastern cottontail rabbit, bobwhite quail, and mourning dove are some of the most common species. Gray fox, opossum, raccoon, beaver, and other furbearers are also common in the area. (Stennis Space Center, 1997a)

3.4.3.3 Threatened and Endangered Species

SSC contains habitat utilized by a large number of Federally and state-listed species. Table 3.4.3-1 lists the species that are known to occur within or near SSC's boundaries.

The Louisiana quillwort (*Isoetes louisianensis*), a Federally endangered and state-imperiled species, has been observed in neighboring counties, but not on SSC.

Table 3.4.3-1: Species with Federal or State Status Potentially Occurring at Stennis Space Center

Scientific Name	Common Name	Status: State	Status: Federal
Plants			
Isoetes louisianensis	Louisiana quillwort [1]	S1	E
Fish			
Acipenser oxyrhynchus desotoi	Gulf sturgeon	E	T
Reptiles and Amphibians			
Alligator mississippiensis	American alligator	–	T (S/A)
Drymarchon corais couperi	Eastern indigo snake [2]	T	E
Gopheus polyphemus	Gopher tortoise [2]	E	T
Birds			
Grus canadensis pulla	Mississippi sandhill crane	E	E
Haliaeetus leucocephalus	Bald eagle	E	T
Pelecanus occidentalis	Brown pelican	E	E
Picoides borealis	Red-cockaded woodpecker [2]	E	E
Mammals			
Felis concolor coryi	Florida panther	E	E
Ursus americanus luteolus	Louisiana black bear [2]	E	T

Source: Stennis Space Center, 1997a; National Aeronautics and Space Administration/GB Tech, 1998

(1) Found in surrounding counties
(2) Not observed during 1998 survey
– Not listed
S1 Critically imperiled because of extreme rarity (5 or fewer occurrences) or vulnerable to extirpation
E Endangered
T Threatened

The bald eagle has been identified at SSC by the Mississippi Department of Wildlife, Fisheries, and Parks and may occur within the MSAAP. It is usually found along coasts, rivers, and large lakes. The red-cockaded woodpecker, listed as endangered by the USFWS and the Mississippi Department of Wildlife, Fisheries, and Parks, may also occur within SSC and the MSAAP area. The Mississippi sandhill crane (*Grus canadensis pulla*) has a very limited range that includes pine savanna areas of SSC. The brown pelican (*Pelecanus occidentalis*) may occur within SSC and the MSAAP area. (John C. Stennis Space Center, 1992; Stennis Space Center, 1997a; U.S. Department of the Army, 1976)

The Gulf sturgeon has been documented in deep pools in the Pearl River. A small population of the gopher tortoise (*Gopherus polyphemus*) has been documented in the Buffer Zone at the northern edge of the SSC Fee Area. They have also been reported as occurring in other areas within the northern and northeastern areas of the Buffer Zone. The Federally threatened and state-endangered eastern indigo snake has been identified by the Mississippi Department of Wildlife, Fisheries, and Parks at SSC. Government agencies

released indigo snakes in Harrison and Marion counties in Mississippi, which may account for sightings at SSC. The American alligator has been sighted at SSC in the main canal, canal branches, lakes, ponds, and lagoons. The alligator is common in Lion Branch. (John C. Stennis Space Center, 1992; Stennis Space Center, 1997a; U.S. Department of the Army, 1976)

The endangered Florida panther (*Felis concolor coryi*) has not been documented as occurring at SSC, but several sightings and vocalizations have been reported. It occurs most often in wilderness areas of forest and swamp, with a range from southern Florida along the Gulf of Mexico to eastern Louisiana. The Federally threatened and state-endangered Louisiana black bear (*Ursus americanus*) is generally found in forests or swamps. Bear tracks have been found, and eyewitness accounts of bear sightings in the Fee Area and Buffer Zone have been reported. (John C. Stennis Space Center, 1992; Stennis Space Center, 1997a)

3.4.3.4 Environmentally Sensitive Habitats

Environmentally sensitive habitats on SSC consist of wetlands.

Wetlands

Within the MSAAP area, wetlands primarily exist along natural stream courses, such as Turtleskin Creek, and Wolf and Lion Branches. Wetland vegetation may also be located in man-made drainage ditches throughout the area. A Wetlands Special Area Management Plan was developed by NASA and the USACE to provide for wetlands mitigation to compensate for the filling in of jurisdictional wetlands during construction activities within the Fee Area. A 455-hectare (1,124-acre) site on NASA property was selected as the wetland mitigation special area. Hydric soils and a pitcher plant bog dominate the area. (U.S. Army Corps of Engineers, 1990; John C. Stennis Space Center, 1992; Stennis Space Center, 1997a)

3.4.4 SSC CULTURAL RESOURCES

For a definition of cultural resources and the cultural resources ROI, as well as a description of the types of laws and regulations that govern these resources, see section 3.1.4.

3.4.4.1 Prehistoric and Historic Archaeological Resources

Archaeological investigations of SSC and the region of the Pearl River Basin indicate that human occupation of the area first occurred approximately 12,000 years ago. Occupation within the region is divided into three periods: the Paleo-Indian Period (10,000 BC to 6000 BC), the Archaic Period (6000 BC to 2000 BC), and the Post-Archaic Period (2000 BC to AD 1700) (U.S. Army Corps of Engineers, 1988b).

The recorded history of the area began in 1699 with the arrival of the French explorer Pierre LeMoyne Sieur d'Iberville. French domination of the area lasted until 1763 when, according to the Treaty of Paris, areas east of the Mississippi River were ceded to Great Britain. Ownership of the region changed hands several times between 1779 and 1817, when Mississippi became a state and the majority of the population was either English or American.

During the early 1800s, settlement patterns were primarily along the Pearl River and, in 1830, the county seat was moved to Gainesville. Large sawmills were built at Gainesville and Logtown in the 1840s, and during the late 1800s and early 1900s, the railroad and Pearl River were primary systems for the transportation of cotton and lumber. The river was also heavily used by Confederate troops during the Civil War (Stennis Space Center, 1997a). The timber mill at Pearlington is believed to have been the largest in the world at the time and the most important commercial center in south Mississippi during this period; however, shortly after the turn of the century, the timber industry began to wane and most of the mills closed. The agricultural and timber industry eras were essentially over by the end of World War II (U.S. Army Corps of Engineers, 1988b), but logging is still an important industry in and around the SSC area, with a large portion of the land in the Buffer Zone continually harvested for timber.

Construction of the MSAAP was begun in 1978 and completed in 1988. SSC (and the associated Buffer Zone) was established in 1961 and encompassed five existing towns: Napoleon, Santa Rosa, Logtown, and Westonia located in the Buffer Zone, and the town of Gainesville located within the Fee Area. When the land was acquired for construction, most of each of the town's buildings were removed.

Archaeological investigations of the SSC region are believed to have begun in 1974 with a reconnaissance-level survey by an archaeologist from Louisiana State University; however, reports of this survey are unsubstantiated, and no report is extant (National Aeronautics and Space Administration, 1995b). The next survey was undertaken in 1984 by the National Park Service and was confined to the MSAAP. No sites were recorded; however, the survey was limited and no systematic transects or subsurface testing was conducted.

In 1988, the Mobile District of the USACE conducted systematic investigations of four locations at the SSC for the Advanced Solid Rocket Motors EA and reconnaissance-level examination of the remainder of the Fee Area (including a resurvey of the MSAAP). Except for the Gainesville and Logtown townsites, no archaeological sites were located anywhere within the boundary of the Fee Area, and three previously recorded sites reported from the Pearl River floodplain area at Gainesville could not be relocated.

Other archaeological surveys conducted in the area include a survey of a proposed 16-hectare (40-acre) landfill in the buffer zone conducted by the Mobile District Corps of Engineers in 1981, and a 1.2-hectare (3-acre) survey of an area north of Igloo Road conducted by Giardino in 1997, specifically for the LTF program. No archaeological sites

were recorded during either survey (National Aeronautics and Space Administration, 1997b).

Consultation with the Mississippi SHPO conducted after the 1988 survey indicates that, based on negative surveys of "virtually all of the high potential zones for archaeological remains (except for the Gainesville and Logtown townsites which are located along the Pearl River floodplain), no further historic properties investigations are recommended for lands owned in fee by NASA at the Stennis Space Center." The Mississippi SHPO formally concurred with these recommendations in December 1989 (Headquarters, U.S. Army Armament, Munitions and Chemical Command, 1990; National Aeronautics and Space Administration, 1997b). In addition, in September 1998, an archaeological survey of the two LTF proposed locations was conducted by Mason Technologies, Inc. No archaeological materials were found during the survey, and a survey report was submitted to the Mississippi SHPO for review. The Mississippi SHPO has concurred with the findings (Mississippi Department of Archives and History, 1998).

3.4.4.2 Historic Buildings and Structures

Historic buildings and structures at the SSC would be associated with any of the historic activities described in section 3.1.4.1 (e.g., farmsteads; homesteads; small communities; remains of buildings, structures, or other features associated with the cotton or timber industry; Civil War sites; and/or sites associated with the MSAAP).

Of the facilities at SSC, nine predate the Center's establishment in 1961. Seven of these have been determined ineligible for listing in the National Register by the Mississippi SHPO, and the remaining two are located outside the LTF ROI (National Aeronautics and Space Administration, 1997b). Of the Center's post-1961 facilities, there is currently one National Register-listed property, the Rocket Propulsion Test Complex, which consists of three test stands. The property is located in the southern portion of the Fee Area (outside the LTF ROI) and is a National Historic Landmark.

In June 1994, a meeting between the Chief Architectural Historian for the Mississippi SHPO and SSC was held to determine the need for additional historic buildings and structures surveys. Discussions resulted in an agreement that an overall architectural assessment of the installation was not required. The agreement also indicated that all Man in Space-associated 1960s-era buildings and structures would be considered potentially significant and would be formally evaluated in terms of National Register eligibility for their role in NASA's Man in Space theme when they reach 50 years in age (the year 2013). A list of these buildings is provided in appendix E.

Buildings and structures within the LTF ROI include Building 9138 (constructed in 1982) located within the 549-meter (1,800-foot) ESQD and Building 9143 (constructed in 1983) located within the proposed campus complex area. Based on the agreement with the Mississippi SHPO, neither building is considered eligible for listing in the National Register.

3.4.4.3 Native Populations/Traditional Resources

At the time of European contact (1699), the SSC region was populated by the Choctaw. Primarily agriculturalists, the Choctaw material culture is most often recognized by double-weave (baskets within baskets) swamp cane and oak basketry (Environmental Laser, 1997).

In 1830, the Indian Removal Act authorized relocation of many Native American tribes to the western United States. One of the most notable of the relocations involved the Five Civilized Tribes of the Choctaw, Chickasaw, Creek, Cherokee, and Seminole. Of the five tribes, the Choctaw faired the best, because of their willingness to comply with the government's action.

Nonetheless, the Treaty of Dancing Rabbit Creek (also in 1830) forcibly relocated most of the Choctaw Nation from their homeland in Mississippi, west to what is now known as southeastern Oklahoma; a few remained, but lost all rights to their land. Over 20,000 Choctaw were moved on this long journey, but only 7,000 survived the relocation along what has come to be called the "Trail of Tears."

Today, the Choctaw population has increased from the 7,000 survivors to more than 70,000, the majority of whom live in and around the community of Durant, Oklahoma (Environmental Laser, 1997). The Mississippi Band of Choctaw Indians numbers around 8,000. This Federally-recognized tribe is located in east-central Mississippi near Philadelphia. The Mississippi Band of Choctaw Indians is now the largest employer in Neshoba County, Mississippi, and one of the ten largest in the state (Mississippi Band of Choctaw Indians, 1997).

Significant traditional resources sites are subject to the same regulations and are afforded the same protection as other types of historic properties. Traditional sites associated with the Choctaw could include archaeological and burial sites, mounds, ceremonial areas, caves, rockshelters, hillocks, water sources, plant habitat or gathering areas, or any other natural area important to this culture for religious or heritage reasons. By their nature, traditional resources sites often overlap with (or are components of) archaeological sites. As such, any archaeological sites in the vicinity of SSC could also be considered traditional resources sites or contain traditional resources elements. Currently, no traditional cultural properties have been identified within the ROI.

3.4.5 SSC GEOLOGY AND SOILS

This section provides an overview of the physiography, geology, soils, and geologic hazards in the vicinity of SSC. In general, the ROI is defined by the regional geologic setting and the areas in the immediate vicinity of the proposed PTC Complex and I&T Complex that could be affected by construction and operation activities.

3.4.5.1 Physiography

SSC lies in the Eastern Gulf Coastal Plain region of the United States within the Pine Meadow geomorphic unit. The topography of the area is mostly low and flat, with some slight variations in elevation. Most of the area has a slope of less than 2 percent. The elevation varies from near sea level in the south to approximately 11 meters (35 feet) above msl in the north portion of the buffer zone (National Aeronautics and Space Administration, 1997d). Fee Area elevations range from approximately 1.5 to 9 meters (5 to 30 feet) above msl (John C. Stennis Space Center, 1992).

3.4.5.2 Geology

Within the SSC area, Holocene alluvium, Quaternary coastal deposits, and the Citronelle Formation of the Pliocene age occur at the surface. These surface soils contain locally heavy concentrations of organic material and organic staining. Well-preserved wood has been found at depths of approximately 15 meters (50 feet), which indicates geologically recent subsidence typical of the delta area of the Gulf Coast. The Citronelle formation is composed of sands and gravel with lesser amounts of clay (National Aeronautics and Space Administration, 1997d).

The base of the Citronelle formation is generally about 46 meters (150 feet) deep in the SSC area. Underlying the Citronelle formation is over 610 meters (2,000 feet) of undifferentiated Miocene-Age sediments composed of clays, slits, and sands with thick gravel layers. The individual layers commonly reach 30 meters (100 feet) in thickness. Bedrock in the SSC area is thought to be as much as 3,000 to 3,700 meters (10,000 to 12,000 feet) below the surface (National Aeronautics and Space Administration, 1997d).

3.4.5.3 Soils

The soil groupings throughout SSC are complex and varied. A majority of the soils in the SSC, including the proposed PTC Complex and I&T Complex areas, are of the Atmore, Smithton, and Escambia soil groupings. These soils are generally composed of poorly to somewhat poorly drained silty and loamy soils of moderate permeability with slow to medium runoff characteristics. They are generally acidic with high organic matter and weathered clay mineralogy (John C. Stennis Space Center, 1992).

3.4.5.4 Geologic Hazards

Unstable Soils

Soils within the vicinity of the LTF site exhibit low shrink/swell susceptibility and low to moderate susceptibility to water and wind erosion (Iowa State University Statistical Laboratory, 1998). Consequently, unstable soils are not anticipated at the LTF site.

Seismicity

SSC is located in a seismic zone 0, meaning that seismic disturbances are rare and associated risks are considered low (National Aeronautics and Space Administration, 1997d). There are no known areas of volcanic activity within the State of Mississippi.

3.4.6 SSC HAZARDOUS MATERIALS AND HAZARDOUS WASTE MANAGEMENT

For a general discussion of the regulations governing hazardous materials and hazardous waste management and a discussion of the ROI, see section 3.1.6.

3.4.6.1 Hazardous Materials Management

Numerous types of hazardous materials are used to support the various missions, research, operations, and general maintenance at SSC. These materials include common building paints, industrial solvents, and certain chemicals used in the scientific and photographic labs. Propellant and oxidizer are used to test rocket engine components. Hazardous materials are also used by on-station contractors supporting station construction and operations. (U.S. Department of the Air Force and National Aeronautics and Space Administration, 1993) Contractors at the MSAAP use hazardous materials such as solvents and paints, chlorine, sulfuric acid, oils, sodium hydroxide, and sulfide solutions in maintenance activities.

Hazardous materials management is the responsibility of each individual or organization. Individual contractors may obtain hazardous materials through their own organizations, local purchases, or other outside channels.

Emergency response to spills or releases of hazardous materials is governed by the requirements of CERCLA, EO 12580, and the Emergency Planning and Community Right to Know Act. Under CERCLA, NASA, the resident agencies at SSC, and contractors are responsible for reporting releases of reportable quantities to the National Response Center within 24 hours. SSC implements this program through NASA Management Instruction 1040.1C, which provides a comprehensive emergency plan. Routine and accidental releases as well as quantities stored onsite of listed chemicals are reported annually in accordance with Section 313 of the Emergency Planning and Community Right to Know Act. (Stennis Space Center, 1997) MSAAP maintains a Spill Contingency Plan. The SSC Fire Department is trained to handle hazardous materials. (EDAW, Inc., 1998b)

The Federal Oil Pollution Prevention regulations require the preparation of SPPCs for aboveground petroleum storage tanks with a capacity greater than 2,498 liters (660 gallons) or 4,998 liters (1,320 gallons) in aggregate. SSC has a limited number of tanks to which this requirement applies. SSC maintains an SPCC Plan as part of the Integrated Contingency Plan (SPG 4130.3C). This Plan also covers propane tanks on SSC. (Stennis Space Center, 1997) MSAAP maintains an SPCC Plan as well as a Spill Contingency Plan. Coordination and communication between MSAAP and SSC are elements in these plans. (McNeely, 1998)

3.4.6.2 Hazardous Waste Management

Hazardous waste management at SSC is regulated under 40 CFR 260-280 and the Mississippi Department of Environmental Quality's hazardous waste program. These regulations are implemented through the SSC Environmental Resources Document and through MSAAP's Hazardous Waste Management Plan and Waste Handling Procedure.

NASA is the only Large Quantity Generator at SSC. Six resident agencies are classified as Small Quantity Generators and maintain their own U.S. EPA identification numbers. MSAAP generates only small quantities of hazardous waste and has no RCRA permits at present. Tenants may use an Army hazardous waste disposal contract for disposal to the treatment, storage, and disposal facilities. Table 3.4.6-1 summarizes the RCRA status for NASA and resident agencies at SSC.

Table 3.4.6–1: RCRA Status for NASA and Resident Agencies

Generator	Status	Building
U.S. Geological Survey	Conditionally Exempt SQG	2101
NASA John C. Stennis Space Center	LQG and Burner Blender	1100
Naval Oceanographic Office	SQG	1002A
University of Southern Mississippi Center for Marine Sciences	Conditionally Exempt SQG	1103
Naval Research Lab	Conditionally Exempt SQG	1000
U.S. Environmental Protection Agency	Conditionally Exempt SQG	1105
NOAA National Data Buoy Center	SQG	3203, 3205

SQG = Small Quantity Generator
LQG = Large Quantity Generator

All hazardous waste generated is labeled with the appropriate U.S. EPA identification number and is transported, treated, and disposed of under this number. All individuals or organizations at SSC are responsible for administering the applicable regulations and plans regarding hazardous waste and for complying with applicable regulations regarding the temporary accumulation of waste at the process site. MSAAP-generated wastes are handled in accordance with the applicable requirements.

Individual contractors and organizations maintain hazardous waste satellite accumulation points and 90-day hazardous waste accumulation areas in accordance with 40 CFR 262.34. All hazardous wastes placed in the accumulation areas must by shipped offsite for treatment, storage, and disposal within 90 days of the start of accumulation (satellite accumulation areas are not subject to the 90-day rule). NASA conducts independent audits of the treatment, storage, and disposal facilities it uses. (Stennis Space Center, 1997) MSAAP maintains a hazardous waste accumulation area in Building 9157. MSAAP hazardous waste accumulation is currently far below capacity since the facility was

originally designed for ammunition manufacturing and the larger quantities of hazardous waste associated with that mission. Currently, MSAAP's hazardous waste generation is very low, typically consisting of spent fluorescent bulbs and two to three 208-liter (55-gallon) drums of paint and solvent wastes per year. (McNeely, 1998)

3.4.6.3 Pollution Prevention

SSC has a waste minimization program that involves hazardous product substitution, waste stream segregation, material handling improvement, alterations in production scheduling, and increased recycling activities. SSC also has an ongoing program to evaluate the use of solvents/degreasers in parts washers, with the goal of finding suitable alternative solvents to reduce adverse environmental impacts and employee exposures. Recent efforts include the installation of a new deionized water/ultrasonic verification system that reduces usage of Freon 113, and the installation of a new enclosed parts washer to reduce usage of 1,1,1-trichloroethane. (Stennis Space Center, 1997)

3.4.6.4 Remediation

SSC is in the process of investigating potential historical spills, releases, and disposal incidents under CERCLA as amended by the Superfund Amendments and Reauthorization Act, which mandated that the U.S. EPA establish a listing of Federal facilities where hazardous waste has been generated and/or stored, treated, or disposed of in the past. Although SSC has not been listed as a CERCLA facility, NASA is taking a proactive approach to investigate areas that may have been impacted by historical releases.

Under the CERCLA site investigation process, Preliminary Assessments are conducted to determine whether further investigation is warranted. These assessments were conducted for 40 sites at SSC. Twenty-six of these were found to be clean or have contamination that can be easily removed. Fourteen sites require additional investigation; nine are being investigated as site investigations or expanded site investigations, three are undergoing an RI/FS, and two are scheduled to begin the RI/FS stage. Once the extent of contamination is determined at these sites, an evaluation of potential risks and feasibility of soil and groundwater clean-up options will be made. (Stennis Space Center, 1997)

The location proposed for the LTF facilities has no known contamination, either surface or subsurface. The closest potentially contaminated area is associated with the Keller Range at the edge of the proposed LTF buffer zone. The Keller Range, now closed, was the site of hazard classification test, TNT equivalency tests, and shielding studies, all of which were conducted between 1968 and 1980. Contamination at the site consists of low-grade energetic materials at the surface. No groundwater contamination is associated with this site. Based on environmental studies, the installation has concluded that the site requires no further action. (National Aeronautics and Space Administration, 1998)

3.4.6.5 Storage Tanks

For a general discussion of Federal regulations of storage tanks, see section 3.1.6.5.

The Mississippi Department of Environmental Quality has adopted the Federal UST program and is the administering agency for USTs at SSC. SSC undertook replacing and upgrading USTs in 1992. Currently, the MSAAP contains no regulated USTs and aboveground storage tanks meet or exceed regulatory standards.

There are no storage tanks identified in the area of the proposed LTF facilities.

3.4.6.6 Asbestos

The MSAAP buildings do not contain asbestos. (EDAW, Inc., 1998b)

3.4.6.7 Polychlorinated Biphenyls

For a general discussion of PCBs, and their regulation, see section 3.1.6.7.

In March 1989, SSC implemented a program to replace transformers with PCB-contaminated fluid or rebuild such transformers with non-PCB material and dispose of PCB-contaminated fluid. Existing transformers were retro-filled with non-PCB electrical insulating oil and reclassified to ensure compliance with U.S. EPA regulations of 40 CFR 761. Due to the minimal load on the transformers and the leaching of trapped PCB-contaminated fluids, there are currently several large pad-mounted transformers at SSC that are PCB-contaminated. All other pole-mounted and smaller pad-mounted transformers containing PCBs have been removed. SSC conducts an annual PCB status report to monitor the remaining contaminated transformers. In addition, there are fluorescent lighting fixtures with PCB-containing ballasts that are replaced on failure with non-PCB ballasts. Disposal of the PCB wastes is in accordance with state and Federal regulations. (Stennis Space Center, 1997)

PCB-contaminated equipment could occur at the existing facilities proposed for modification for LTF. PCB contamination in transformers and other equipment must be verified or tested before proceeding with facility modifications.

3.4.6.8 Lead-based Paint

Lead-based paints have never been used on SSC. (Stennis Space Center, 1997)

3.4.7 SSC HEALTH AND SAFETY

For a definition of health and safety resources, definition of the ROI, and a description of the types of laws and regulations that govern these resources, see section 3.1.7.

3.4.7.1 Regional Safety

SSC has entered into a mutual aid agreement with every city within a 80-kilometer (50-mile) distance to provide assistance in the event of an on station emergency (EDAW, Inc., 1998b). Each organization may request equipment and manpower in the event of a fire or other emergency. In an emergency that may affect off-station areas, SSC contacts the appropriate county emergency management staff.

3.4.7.2 On-station Safety

NASA provides guidance to contractors for health and safety through NASA Federal Acquisition Regulation Supplement. Health and safety programs for construction and support activities must be at least as effective as OSHA programs. Contractor health and safety programs must meet at least the minimums required by OSHA. (National Aeronautics and Space Administration, 1993)

The Safety and Mission Assurance Directorate ensures the health and safety of NASA employees and other personnel on SSC through program audits and site inspections. Customers consult with this Directorate to plan and implement operations requirements safely and effectively.

3.4.8 SSC LAND USE AND AESTHETICS

This section describes the land uses and aesthetics for the area potentially affected by the location of the LTF and support facility on SSC. The ROI includes the MSAAP, a leased area on SSC where the proposed activity is to occur, and the area in the surrounding vicinity.

3.4.8.1 Regional Land Use

Regional land use includes the area outside the SSC Fee Area (the main part of the complex). This area includes the Buffer Zone (50,614 hectares [125,071 acres]), which is composed of land owned mostly by private individuals with scattered parcels of government land. The purpose of the Buffer Zone is to provide an acoustical and safety protection zone between operations being conducted at SSC and nearby communities. This zone is primarily in Hancock County but does extend into the neighboring Saint Tammany Parish in Louisiana to the west and into Pearl River County, Mississippi, to the northwest. All activities within the Buffer Zone are subject to specific easement provisions that specify that habitable structures cannot be built within the buffer area. However, other uses such as farming, livestock raising, mining activities, wildlife management areas, and commercial forestry are allowed and are currently being utilized in this buffer area. The SSC Fee Area and Buffer Zone are not affected by the comprehensive plans or zoning laws of Hancock or surrounding counties because they are under Federal control. (Stennis Space Center, 1997)

3.4.8.2 On-base Land Use

The SSC Fee Area (5,585 hectares [13,800 acres]) is composed of government land entirely in the western sector of Hancock County, Mississippi. Within this area are two major areas of utilization as described in the *John C. Stennis Space Center Facilities Master Plan* (National Aeronautics and Space Administration, 1997d). These areas are the NASA-controlled area of the Stennis Complex and the MSAAP area that NASA currently leases to the Army. Figure 3.4.8-1 shows the existing land uses of SSC Fee Area and the Buffer Zone surrounding SSC.

The NASA-controlled area of SSC consists of eight land use types. These land uses are the propulsion testing area, the test support area, waterways and canals, the engineering/administration area, utility areas, recreation areas, maintenance/supply/security areas, and open areas. (National Aeronautics and Space Administration, 1997d)

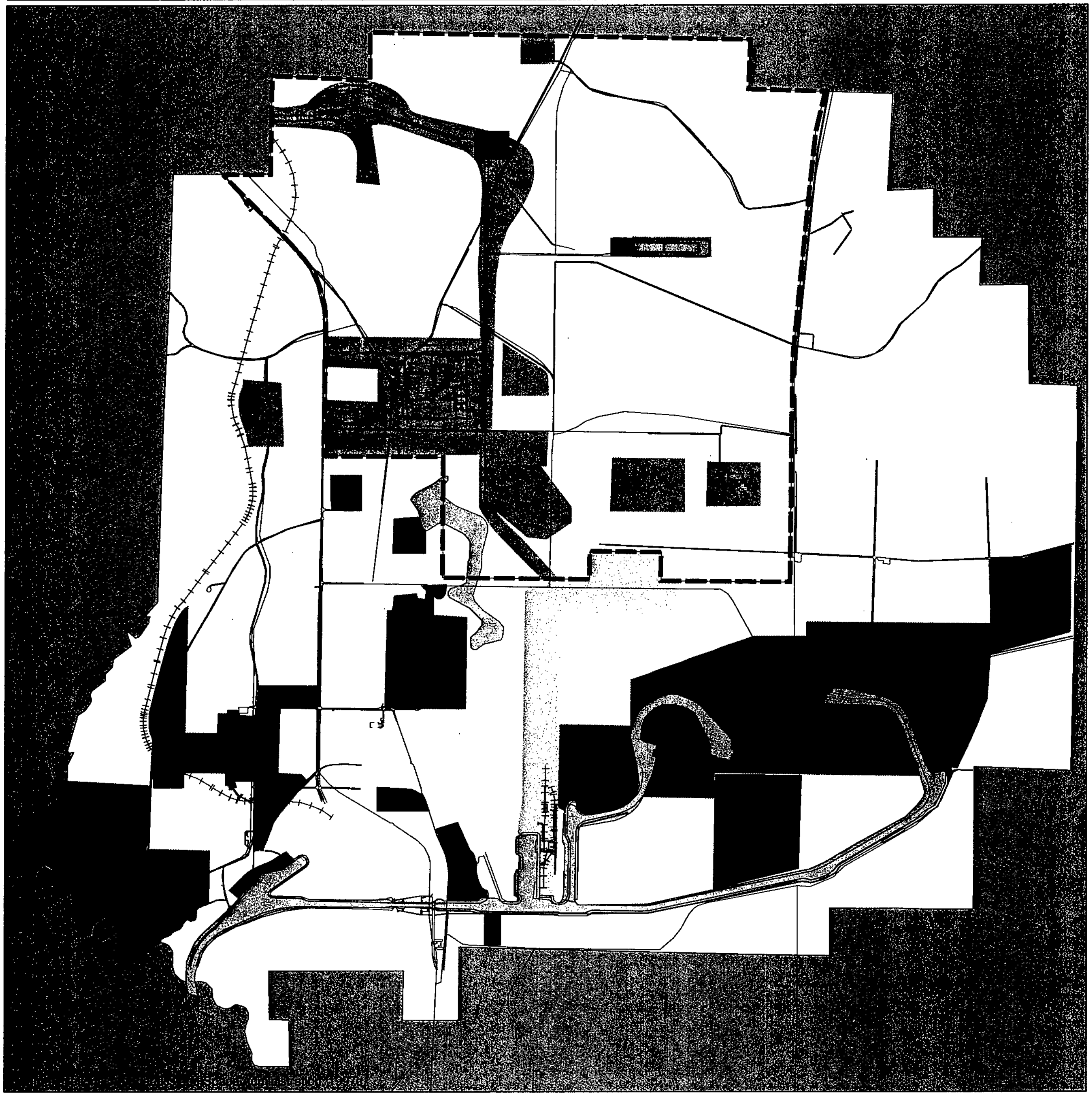
The Army-leased MSAAP area, which is located in the northern half of the Fee Area of SSC, consists of 1,755 hectares (4,337 acres). The land use types of MSAAP are of an industrial nature but are not specified in the *John C. Stennis Space Center Facilities Master Plan* (National Aeronautics and Space Administration, 1997d). They include an ammunition production plant located in the southwestern section of MSAAP, weapon storage igloos located in the northeastern section, office buildings located in the southern section, a small landfill, which was closed in July, 1996 according to state and Federal regulations, near the center of MSAAP and various roads and rail lines scattered throughout MSAAP. Currently, private commercial operations occur at the weapons storage igloos and the adjacent building in the 9600 area, as well as a small building in the north central section on MSAAP in the 9138 area (see figure 2-10) (National Aeronautics and Space Administration, 1998). The rest of the land in MSAAP is considered open and consists of commercial pine forests.

3.4.8.3 Aesthetics

The ROI for aesthetics include the general visual environment surrounding the proposed facilities and areas of the facilities visible from off-station areas.

The visual environment in the vicinity of the proposed LTF is characterized by the space center activities that occur on the grounds. In the immediate area of the proposed PTC Complex is the MSAAP, which consists of an industrial type complex, office buildings, and warehousing/storage buildings. The natural landscape in this vicinity is dominated by pine plantations in various stages of growth. The topography of the ROI is generally flat, with elevations ranging from 4 meters (12 feet) to approximately 9 meters (30 feet) above msl. The area has a low visual sensitivity because of the buffer zone around SSC and the flatness of the area limits any prominent vistas.

Since public access to SSC and MSAAP is highly restricted, viewpoints are primarily limited to landowners just to the north of the proposed facility and to visitors at the Visitor's Center.



EXPLANATION

- Propulsion System Testing
- Test Support
- Engineering/Administration
- Utility
- Maintenance/Supply/Security
- Restricted
- Mitigation Area
- Commercial
- Recreation
- Agriculture
- Industrial
- Water
- Open Space
- Mississippi Army Ammunition Plant Boundary

NORTH

Scale 1:50,000

0 .4 .8 Miles

0 .7 1.3 Kilometers

Existing General Land Use Areas on Stennis Space Center

Stennis Space Center, Mississippi

Figure 3.4.8-1

0036ltf

3.4.9 SSC NOISE

For a general discussion of noise and the method of measurement used in this EA, see section 3.1.9.

Background Noise Levels off SSC

SSC is surrounded by a large, approximately 50,614-hectare (125,071-acre), uninhabited Buffer Zone consisting of mostly forest, pasture lands, and wetlands. This Buffer Zone provides protection to nearby communities from noise and vibrations resulting from rocket tests. Several communities in Mississippi are situated just outside the buffer zone including Pearlington to the south; Waveland and Bay St. Louis to the southeast; Kiln to the east; and Picayune to the northwest. The communities of Slidell and Pearl River, Louisiana, are southwest of SSC. These cities would be expected to have noise levels typical of an urban environment with levels between 45 and 80 dBA. Outside the cities, noise levels would be typical of a rural environment with noise levels between 45 and 50 dBA.

Noise created by static testing of large engines has affected the local environment surrounding SSC. Historically, the only measure of SSC's effect on the local ambient noise levels has been complaints by citizens in the communities surrounding the facility. During the Saturn V rocket testing program, NASA logged 160 complaints of which 57 resulted in formal administrative claims. To reduce the number of complaints during the testing of the Space Shuttle Main Engines, SSC implemented a pre-test prediction of the Overall Sound Pressure Level at the Buffer Zone boundary and at acoustic focusing points beyond the Buffer Zone. If the predicted Overall Sound Pressure Level is greater than 120 dB, no firing is approved until meteorological conditions improve. If the predicted Overall Sound Pressure Level is between 110 and 120 dB, firing is at the discretion of the project manager. Since this program has been implemented, there have been no noise complaints about noise that could be attributed to rocket test firing operations (John C. Stennis Space Center, 1992).

Background Noise Levels on SSC

The major noise sources at SSC are associated with static rocket motor testing. When tests are not being conducted, the noise levels at SSC are very low. The sources of continuous noise at the facility are diesel generators, pumps, boilers, and automotive traffic. The effects of the diesel generators, pumps, and boilers are minimal because they are contained within structures. Traffic noise is highest during the morning and evening as employees are transporting themselves to and from work. One-hour noise measurements taken at SSC in 1974 when no rocket tests were being conducted showed noise levels between 41 and 45 dBA. Static rocket tests on SSC can produce noise levels exceeding 140 dBA in SSC's Fee Area. (John C. Stennis Space Center, 1992)

3.4.10 SSC SOCIOECONOMICS

This section provides a socioeconomic overview of the region surrounding SSC. It includes an overview of population and employment in the area.

3.4.10.1 Region of Influence

For the purposes of this analysis, the region surrounding SSC is defined as an area that includes those communities within approximately one hour's drive from the proposed test site. The drivetime is delineated by using a computer program that assumes a journey carried out within the legal speed limits and in moderate traffic densities. Figure 3.4.10-1 illustrates the extent of the region. While the drivetime polygon covers all or part of nine counties or parishes, five constitute the majority of the defined region. These five counties or parishes are Hancock, Harrison, and Pearl River counties and Orleans and St. Tammany parishes, and they include the communities of Picayune and Gulfport and part of New Orleans.

Each of the five jurisdictions that compose the major part of the 60-minute drive time rank within the top 20 most populated of 146 counties and parishes of Mississippi and Louisiana. Orleans Parish, which contains part of New Orleans, had the highest population in Louisiana in 1995, while Harrison ranked second in Mississippi.

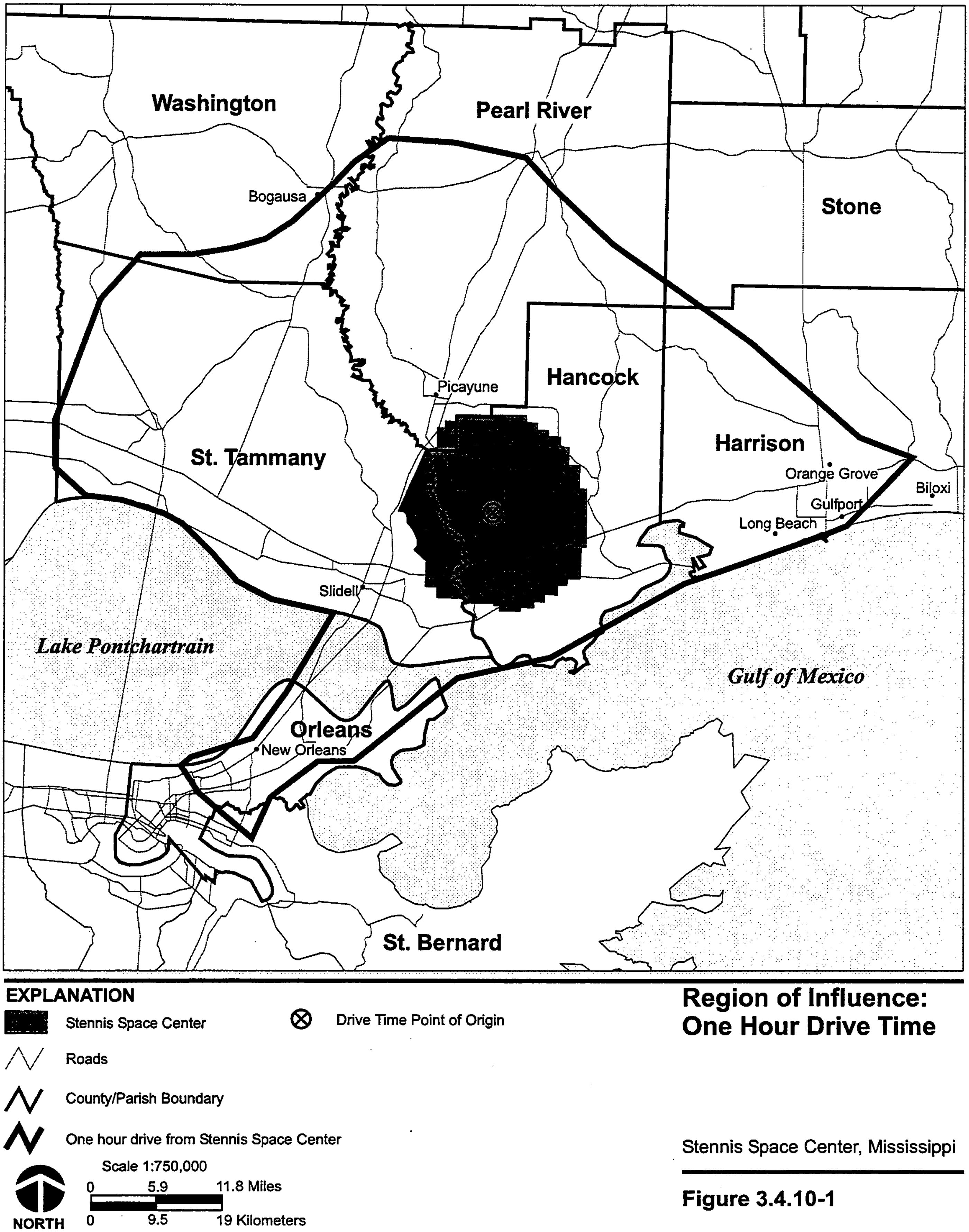
3.4.10.2 Population

In 1997, there was a population of 443,584 within a 60-minute drive of the test site. This population is forecast to increase 1.6 percent annually to 480,853 by 2002. A straight-line projection suggests that the population will grow to 504,701 by 2005.

Those referred to as economically active constitute about 71 percent of the regional population. Despite a discernible trend in the aging of the local population, this proportion remains constant through 2005.

3.4.10.3 Employment

The five counties and parishes had 312,490 non-Federal jobs in 1993. If the forecast composite growth rate in jobs for the States of Louisiana and Mississippi were applied to the five-county/parish area, there would be approximately 361,000 jobs in the region by 2005. This would constitute an increase in non-Federal jobs of a little over 15 percent.



Region of Influence: One Hour Drive Time

Stennis Space Center, Mississippi

Figure 3.4.10-1

3.4.11 SSC TRANSPORTATION

The ROI for transportation potentially affected by the LTF at SSC includes key Federal, state, and local roads within Hancock County which access SSC and any contiguous waterways. Area rail networks and airway facilities are described.

Roadways—Off-installation Network

Primary access routes outside SSC facilities include I-10, I-59, US-90, and SH-607. Table 3.4.11-1 describes the various off- and on-installation roadways. Both I-10 and I-59 intersect southwest of SSC and both have interchanges convenient to the two SSC entrances (figure 3.4.11-1). The only direct access to the SSC area is provided from I-59 (north gate) and from I-10 (south gate) by SH-607 (National Aeronautics and Space Administration, 1997b); I-10 and SH-607 intersect some 5 kilometers (3 miles) south of SSC and I-59 intersects approximately 10 kilometers (6 miles) to the north (The Gulf of Mexico Information Network, undated). Site access is also possible via SH-43, which runs along the north and northwest boundaries of the Buffer Zone, and SH-603, which runs along the Buffer Zone's eastern boundary; both meet at the town of Kiln. From Kiln to Waveland, they merge and, at their I-10 intersection, divide to two 4-lanes (with a median) known as SH-43/603 (Wilkinson, 1998). South of SSC, US-90 connects to SH-607, providing access to major Gulf Coast population centers. These roads are maintained by the state (Wilkinson, 1998).

Roadways—On-installation Network

There are approximately 50 kilometers (31 miles) of primary roads and 24 kilometers (15 miles) of secondary roads on SSC. Primary roads are designed to carry wheel loads of up to 5,440 kilograms (12,000 pounds); secondary roads, 4,536 kilograms (10,000 pounds). Most roads serving the docks, test stand, and warehouse areas are hard-surfaced, primary roads. (National Aeronautics and Space Administration, 1997c) Five major roads serve SSC traffic needs: Shuttle Parkway (a portion of SH-607), Endeavor Boulevard, Road J, Balch Boulevard, and Saturn Drive. Shuttle Parkway, a major route, is the only roadway traversing the entire Fee Area. Balch Boulevard lies on the east side of the present Engineering and Administration Area, connecting Road J and Saturn Drive. The proposed LTF site is located northeast of the intersection of Andrew Jackson and Igloo roads. The primary access routes to the proposed LTF site at the MSAAP are Flat Top Road, Bombing Range Road, Andrew Jackson Road, and Dummy Line Road. There are 40 kilometers (25 miles) of paved roads at the MSAAP, as well as two highway connections; state highways exit from both the north and south. Both I-59 and I-10 are approximately 13 kilometers (8 miles) away. (Operation Enterprise, 1996)

3.4.11.1 Waterways

Off-installation

The MSAAP is 32 kilometers (20 miles) from the nearest full-service, shallow-water port, Port Bienville, and 72.4 kilometers (45 miles) from the deep-water Port of Gulfport

(Operation Enterprise, 1996). Figures for 1996 indicate that the Port of Gulfport had 1.8 million metric tons (1.99 million tons) of foreign cargo and 0.11 million metric tons (0.12 million tons) of domestic cargo, for an approximate total of 1.9 million metric tons (2.1 million tons) (U.S. Army Corps of Engineers, Water Resources Support Center, 1996). The main channel is 11 meters (36 feet) deep (Compass North America, Inc., 1998).

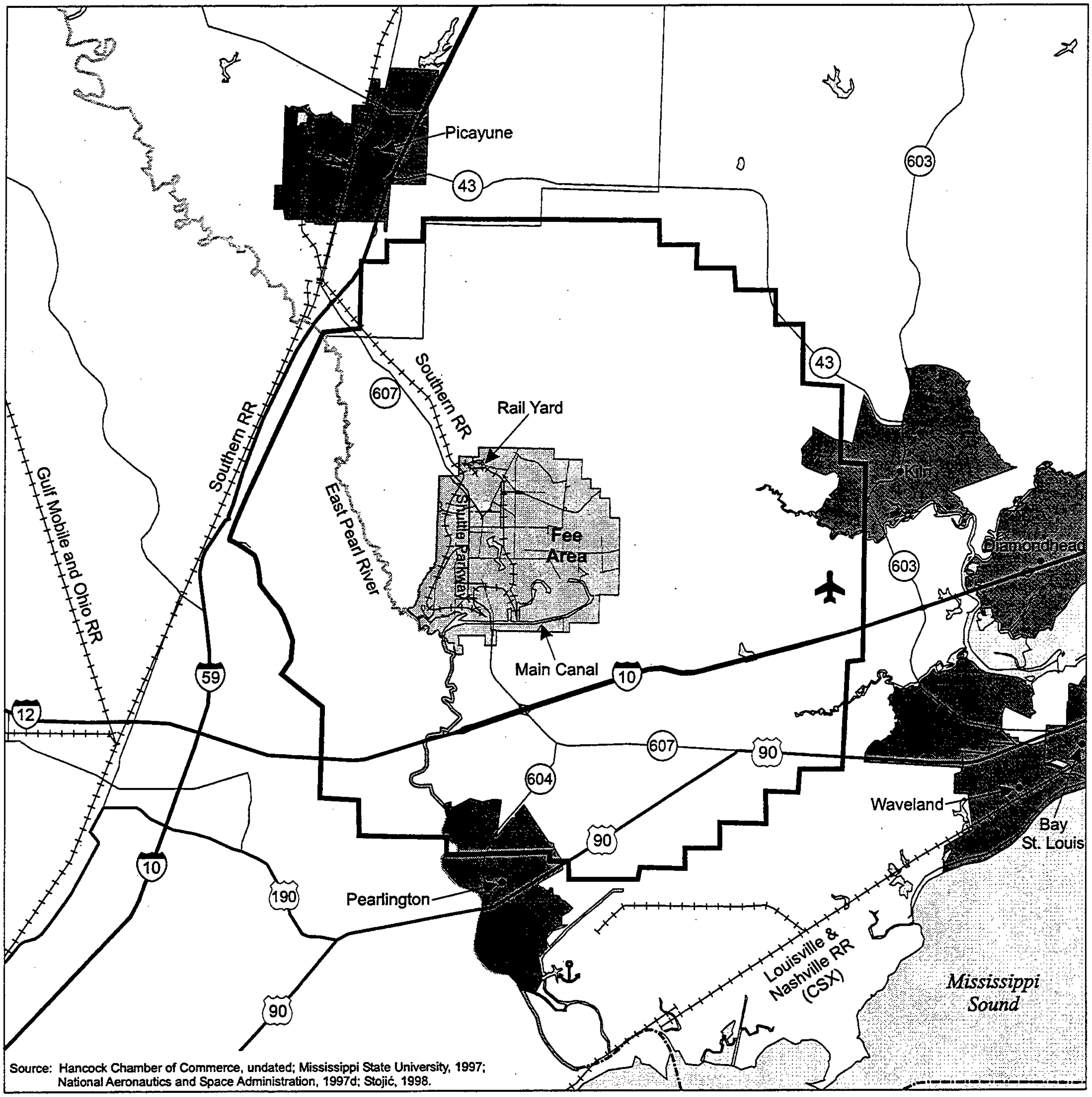
Table 3.4.11–1: Stennis Space Center Area Roadways

Roadway	Lanes	Direction	City/Roadway Links	Segment	1996 ADT
Off-installation					
I-10	4-lane expressway	E-W	Slidell, LA, Diamondhead	East of SH-43/603	33,000
				West of SH-607	31,000
			Gulfport	East of SH-607	29,000
I-59	4	N-S	Poplarville (via SH-53)	North of SH-607	18,000
				South of SH-607	21,000
US-90	4-lane arterial	E-W	Bay St. Louis, Waveland	East of SH-607	8,100
SH-43	4 (2)-lane[1] arterial		Kiln, Picayune, SH-603, I-59, Stennis Air Industrial Park	West of SH-603	3,400
SH-603	4-lane arterial		Kiln, Necaise, Bay St. Louis	North of I-10	7,500
SH-607	4-lane arterial	N-S	Picayune, I-10, I-59	North of I-10	5,300
			Santa Rosa,	NW of SSC	4,600
			SSC Bay St. Louis, and	South of I-10	7,200
			Waveland	Between SSC and I-59	3,100[2]
On-installation					
Balch Boulevard	2-lane local	N-S	Road J and Saturn Drive	–	NA
Saturn Drive	2-lane local	E-W	Shuttle Parkway	–	NA
Trent Lott Parkway	4-lane arterial	N-S	North and South Gate Entrances	–	see SH-607

Source: Collier, 1998; Gulf Regional Planning Commission, 1995; National Aeronautics and Space Administration, 1997c; Taylor, 1996; Wilkinson, 1998.

[1] The state is in the process of converting this roadway to a divided 4-lane north of I-10.

NA = Information not available



EXPLANATION

	Roads		Railways		Intracoastal Waterway
	Interstate Roads		Stennis International Airport and Industrial Park		
	U.S. Highways		Port Bienville		
	State Highways		SSC Buffer Zone		

NORTH

Scale 1:250,000

0 3.2 6.3 Kilometers

0 2 3.9 Miles

Transportation Network

Stennis Space Center, Mississippi

Figure 3.4.11-1

0022ltf

The SSC canal system accesses the Pearl River waterways. Data for the East Pearl River indicates the total of commodities transported during 1995 was 0.27 million metric tons (0.3 million tons). Total trips on the Pearl River in 1995 were 52 vessels with drafts of 1.8 meters (6 feet) or less. For the East Pearl River, totals were as follows: foreign, 76 upbound pass and dry cargo vessels and 75 downbound; upbound domestic, 145 tows or tugs, 83 dry cargo vessels, and 174 tankers; downbound domestic, 147 tows or tugs, 83 dry cargo, and 172 tankers. (U.S. Army Corps of Engineers, Water Resources Support Center, 1996)

Onsite Facilities

MSAAP has no onsite docking facilities; the SSC canal is located 7 kilometers (4 miles) from the proposed site. Within the SSC Fee Area, 14 kilometers (9 miles) of man-made canal link to the East Pearl River through a lock system (National Aeronautics and Space Administration, 1997b). The Pearl River provides access to the Gulf and the national waterway transportation system via a 34-kilometer (21-mile) route terminating at the Gulf Intracoastal Waterway (Southern Mississippi Planning and Development District, 1998).

Available dock services include the Claremont II (a 1,200-horsepower push-type tug), a crane with a 181-metric ton (200-ton) capacity, and a 159-metric ton (175-ton) auxiliary derrick (National Aeronautics and Space Administration, 1998).

3.4.11.2 Railways

Off-installation

Several railroads service the Gulfport area, including Southern Pacific and Mid-South Railroad, allowing transfer and distribution of cargo to all points in the United States (National Aeronautics and Space Administration, 1997c).

On-installation

Both Norfolk Southern Railway Company's spur from Nicholson into the Fee Area and the SSC Facility Railroad System are downgraded. Eight kilometers (5 miles) of onsite spur lines have not been maintained, but could be refurbished and reactivated. (National Aeronautics and Space Administration, 1997c) Southern also serves the MSAAP, with 17 kilometers (10 miles) of onsite railroad (requiring refurbishment) and a 10-car rail storage capacity. There are no switching yards, rail maintenance facility, rail car scales, or rolling stock available. (Operation Enterprise, 1996) Generally, the railway delivers propellants, cryogenics, and other materials needed for NASA's static rocket engine testing (Department of the Army, 1976). Activation of this rail spur is eligible for Mississippi Major Impact Authority funding (National Aeronautics and Space Administration, 1998).

3.4.11.3 Airways

Off-installation

The nearest air carrier airport providing jet service is Gulfport-Biloxi Regional Airport, approximately 72 kilometers (45 miles) from the MSAAP; the nearest general purpose airport is Stennis International, approximately 15.6 kilometers (9.7 miles) away in Bay St. Louis (Operation Enterprise, 1996). Air services are described in table 3.4.11-2. Four major airlines serve Gulfport-Biloxi Regional. An increase in tourism based on gaming resulted in a 174-percent increase in passengers by 1992 (Mississippi Gulf Coast, 1998; Southern Mississippi Planning and Development District, 1998).

Table 3.4.11-2: Stennis Space Center—Available Airway Facilities

Airport/Airfield	Runway—meters (feet)	Flights
Off-installation		
Gulfport-Biloxi Regional [1]	14-32, all-weather: 2,743 (9,000)	260,000 [1]
	18-36, general aviation: 1,524 (5,000)	
On-installation		
Stennis International	2,591 (8,500)	50 per day average

Source: Mississippi Gulf Coast, 1998; National Aeronautics and Space Administration, 1998; Phillips, 1998.
[1] Runway has a rated load class of 120.2 metric tons (132.5 tons), but can handle larger (up to C-17s), depending on weight dispersal.

On-installation

Stennis International, a general aviation airfield, is operated by the Hancock County Port and Harbor Commission and receives special commercial flights; the site also includes a light industrial park (Coast Electric Power Association, 1998). Stennis is a low-traffic airport, handling some NASA jets and very occasional military traffic (Phillips, 1998).

3.4.12 SSC UTILITIES

The ROI for utilities includes all or portions of the service areas of each utility provider that serves SSC and local Hancock County communities. Where warranted, Armament Retooling and Manufacturing Support incentive is available from funding approved by the U.S. Congress to the U. S. Army. Funding application and Army approval is processed through MSAAP to cover connections and improvements.

3.4.12.1 Water Supply

Off-installation

Hancock County has several independent water systems, of which nine are private (Southern Mississippi Planning and Development District, 1991). The City of Bay St. Louis is its largest municipality, with Waveland the only other incorporated area. The Bay

St. Louis Water Company supplies city groundwater at a 13.7 million-liter (3.61 million-gallon) per day capacity, with an average daily consumption of 3.63 million liters (0.96 million gallons), a peak consumption of 4.54 million liters (1.2 million gallons) per day, and a storage capacity of 1.89 million liters (0.50 million gallons) (Southern Mississippi Planning and Development District, 1998). More recent figures indicate consumption for 1997 averaged 3.8 million liters (1.0 million gallons) per day (Moore, 1998). The City of Waveland has a well system capacity of 3.10 million liters (0.82 million gallons) per day, an average consumption of 1.89 million liters (0.50 million gallons) per day, and a storage capacity of 1.14 million liters (0.30 million gallons) (Southern Mississippi Planning and Development District, 1998). Waveland can pump up to 8,180 liters (2,161 gallons) per minute; its total 1997 usage was 879.1 million liters (232.2 million gallons) (Garcia, 1998).

On-installation

Water supplies for SSC include groundwater and surface water (Stennis Space Center, 1997). SSC holds a permit to divert or withdraw from Mississippi public waters for beneficial use; this covers an inlet and pumps that withdraw water from the East Pearl River into the elevated portions of the SSC Access Canal (Stennis Space Center, 1997), providing for both emergency fire suppression and test stand cooling. Potable and industrial water is supplied through six onsite, large capacity wells, three dedicated to potable water. The potable wells have an average capacity of 1.97 million liters (0.52 million gallons) per day. (Stennis Space Center, 1997) The average system demand is approximately 0.45 million liters (0.12 million gallons) per day. Industrial water is supplied by three wells capable of producing 28 million liters (7.5 million gallons) of water per 10-hour period and 68 million liters (18 million gallons) per day (Stennis Space Center, 1997). Testing facilities are supported by a 250 million-liter (66 million-gallon) water storage reservoir.

Potable water is available at the MSAAP at a capacity of 7.6 million liters (2 million gallons) per day via two onsite 5,678-liter (1,500-gallon) per minute water wells and one 946,350-liter (250,000-gallon) elevated storage tank (Operation Enterprise, 1996; Stennis Space Center, 1998). The MSAAP permit allows MSAAP to withdraw 0.57 million liters (0.15 million gallons) per day at a maximum rate of 5,678 liters (1,500 gallons) per minute.

3.4.12.2 Wastewater

Off-installation

Hancock County wastewater treatment is controlled in several ways, including three private WWTPs serving Diamondhead, Oak Harbor, and Jourdan River Shores. Both county industrial parks provide wastewater treatment for pretreated industrial waste. (Southern Mississippi Planning and Development District, 1991). Along with the Bay St. Louis and Waveland, the county operates the Waveland Regional WWTP (the cities are responsible for waste collection and transfer). Southern portions of the county are also on-line with this facility. (Southern Mississippi Planning and Development District, 1991) Bay St. Louis wastewater is handled by Bay St. Louis Water Company, with a capacity of

4.54 million liters (1.20 million gallons) serving 90 percent of the community (Southern Mississippi Planning and Development District, 1998) at a 1997 rate of 3.8 million liters (1 million gallons) per day (Moore, 1998). The City of Waveland handles its wastewater at a daily capacity of 3.03 million liters (0.80 million gallons) serving 75 percent of the community with a 75-percent demand (Southern Mississippi Planning and Development District, 1998).

On-installation

The SSC sewage treatment system design was based on an average flow of 114 liters (30 gallons) per capita per 8-hour shift, and a maximum flow of 2.5 times the average (National Aeronautics and Space Administration, 1997c). SSC maintains an NPDES Permit to discharge to surface waters, modified 7 June 1997 and scheduled to expire in 2002. (Stennis Space Center, 1997)

Domestic sewage treatment is available onsite at MSAAP via an extended aeration, activated sludge system. The MSAAP's three WWTPs are located in one area near the intersection of Andrew Jackson/Leonard Kimble with capacities of 75,708 liters (20,000 gallons) per day, 189,270 liters (50,000 gallons) per day, and 302,832 liters (80,000 gallons) per day. This gives a total capacity of 567,812 liters (150,000 gallons) per day (Gouguet, 1999). Industrial waste treatment also is available at 0.76 million liters (0.20 million gallons) per day (Operation Enterprise, 1996). MSAAP currently uses the 189,270-liter (50,000-gallon) per day plant, with a current load of 132,489.4 liters (35,000 gallons) per day (Gouguet, 1999).

3.4.12.3 Solid Waste

Offsite Facilities

Typically, Hancock County solid wastes are handled by the Pecan Grove Sanitary Landfill in Harrison County and a plant in Standard. The Pecan Grove site accepts Class III waste and Standard accepts Class I rubbish (Kellar, 1998). Levels are currently unavailable. The Central Landfill in Pearl River County has also been used, in view of the anticipated closure of Standard.

Onsite Facilities

Solid waste generated at SSC is either recycled or placed in the onsite, 8-hectare (21-acre) Class A landfill; some construction wastes, rubble, and vegetation can be disposed of in the Class II rubbish landfill (National Aeronautics and Space Administration, 1997b). SSC's current solid waste generation rate is 47 cubic meters (62 cubic yards) daily. It is a NASA goal to extend the life of the Class A landfill through waste minimization (John C. Stennis Space Center, 1992). Officially closed, it has a 15- to 20-year lifespan (EDAW, Inc., 1998b), but is utilized by NASA and NASA tenants only.

Solid waste at the MSAAP is typically handled offsite, 48.3 kilometers (30 miles) away at the Pecan Grove landfill (Gouguet, 1998; Operation Enterprise, 1996). Pecan Grove takes in up to 1.8 million kilograms (2,000 tons) per day (Lovelace, 1998), of which MSAAP

contributes an average of 227 kilograms (0.25 ton) per day (Gouguet, 1998). Both sites are state-of-the-art operations with adequate capacity (Stennis Space Center, 1998). Plans for a permitted industrial waste treatment facility are currently underway.

3.4.12.4 Energy

Electrical—Off-installation

Electricity distributors for both Bay St. Louis and Waveland, as well as rural Hancock County, are the Mississippi Power Company (MPC) and Coast Electric Power Association. For 1997, usage levels for power provided by Coast Electric were as follows: Bay St. Louis, 22,251,855 kWh; Waveland, 26,979,169 kWh; Hancock County, 26,907, 398 kWh (Moore, 1998).

Electrical—On-installation

Electrical power is provided to SSC by MPC through dual overhead 110-kV transmission lines. Existing transmission lines are adequate. The SSC Main Substation is jointly owned by NASA and MPC; power capacity is adequate for current SSC demands (National Aeronautics and Space Administration, 1997c), and alternate power is available through the Energy Power Company. The existing 5-year-old substation services all of SSC, from two separate sources via the MPC.

The SSC distribution voltage and MSAAP utility transmission voltage are both 13.8 kV. The MSAAP's electricity is supplied by MPC/Southern Electric via Army-owned transmission lines and substations (Stennis Space Center, 1998). There are eighteen 2,000-kVA electrical substations with a voltage of 480 (Operation Enterprise, 1996). Recent peak monthly usage amounted to over 1.2 million kWh, approximately 5 percent of total capacity (Havard, 1999).

Natural Gas—Off-installation

The utilities of Bay St. Louis and Waveland provide natural gas distribution (Southern Mississippi Planning and Development District, 1998). Figures for 1997 indicate Bay St. Louis utilized an average 7,079 cubic meters (0.25 million cubic feet) per day of natural gas (Moore, 1998); Waveland consumption was 1,232 cubic meters (43,507 cubic feet) (Smith, 1998), for a total of 2,935 therms. County totals are unavailable.

Natural Gas—On-installation

Natural gas for SSC is obtained through the United Gas Pipeline Company (National Aeronautics and Space Administration, 1997c). Natural gas, supplied by Entex Gas, is available at the MSAAP site (Operation Enterprise, 1996; Stennis Space Center, 1998). System capacity is 13,460 therms per hour (Ham, 1999); the average demand is relatively low at 600,000 cubic feet, or 6,000 therms, per month (Mullican, 1999).

3.4.13 SSC WATER RESOURCES

This section provides an overview of the surface and ground water features, water quality, and flood hazard areas in the vicinity of SSC. In general, the ROI for groundwater is the local aquifers that are directly or indirectly used by SSC. The ROI for surface water is the drainage system/watershed in which SSC is located. The Mississippi Department of Environmental Quality Office of Pollution Control is responsible for the management of the NPDES permit process.

3.4.13.1 Groundwater

Several aquifers can be traced through Hancock County. The area is underlain by fresh water-bearing, southward dipping sands of the Miocene and Pliocene ages. Within these fresh water-bearing sands, one unconfined aquifer is found near the surface, with 10 or more confined aquifers at depth. The fresh water-bearing zone ranges from approximately 600 to 900 meters (2,000 to 3,000 feet) thick. Individual aquifers range from 30 to 140 meters (100 to 450 feet) in thickness. The sequence of alternating sands and discontinuous clay layers, creating the confining nature of the deeper aquifers, is part of the Coastal Lowlands Aquifer System or the Southeastern Coastal Plain System. The aquifers have plentiful supplies of fresh water (John C. Stennis Space Center, 1992).

3.4.13.2 Surface Water

The two primary surface water bodies around SSC are the East Pearl River and the Jourdan River. The Pearl River flows along the southwest boundary of the Fee Area and the Jourdan River flows in a southeasterly direction through the eastern portion of the Buffer Zone. Tributaries that are hydraulically connected to these two rivers are Mike's River and Turtleskin Creek in the East Pearl Basin, and Lion and Wolf Branches of Catahoula Creek in the Jourdan Basin. Approximately 13.7 kilometers (8.5 miles) of man-made canals in the Fee Area are also connected through locks to the East Pearl River (John C. Stennis Space Center, 1992).

The Pearl River system is one of Mississippi's principal rivers, draining an approximate area of 22,688 square kilometers (8,760 square miles). The river divides into distinct channels west of Picayune, Mississippi, where the main stream is known as the West Pearl River. The Pearl River is formed by the confluence of Hobolochitto Creek and Farrs Slough. The Pearl River drains to Lake Borgne and eventually to the Mississippi Sound (John C. Stennis Space Center, 1992).

Dead Tiger Creek and Catahoula Creek form the Jourdan River System in the northeast portions of Hancock County, Mississippi. The Lion and Wolf branches are intermittent streams that drain the eastern section of the Buffer Area. The Jourdan River drains to the Bay of St. Louis and eventually to the Mississippi Sound (John C. Stennis Space Center, 1992).

The southeastern portion of SSC drains into the main access canal. The canal is connected to the East Pearl River through a lock system. A spillway and overflow of the canal drains into Devils Swamp, which discharges into Bayou La Croix and the Bay of St. Louis to the Mississippi Sound (John C. Stennis Space Center, 1992).

The State of Mississippi classifies the Pearl and Jourdan rivers as suitable for recreation. These rivers are also designated Inventory Rivers under the Wild and Scenic River Act. Inventory Rivers, although not strictly protected under the act, are protected by guidelines issued in 1980 by the Council on Environmental Quality, which recommends that Federal agencies consider the effects of Federal actions on these Inventory Rivers. Mike's River and the Lion and Wolf branches are designated as supporting fish and wildlife (John C. Stennis Space Center, 1992).

A permit provides coverage for SSC (under Mississippi's Land Disposal Storm Water General NPDES Permit) and is applicable to the operation of SSC's non-hazardous waste landfill, allowing storm water associated with industrial activity to be discharged into state waters (Stennis Space Center, 1997).

3.4.13.3 Special Flood Hazard Areas

Special Flood Hazard Areas are defined as areas with a 1 percent or greater chance of equaling or exceeding an established flood level in any given year. Such areas are typically referred to as floodplains. EO 11988 directs Federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with occupancy and modifications of floodplains.

The majority of SSC is in an area of minimal flooding. The documented floodplains at SSC include a 100-year floodplain along the East Pearl River along the western edge of SSC, and 100-year floodplains along the Wolf and Lion branches of Catahoula Creek in northeastern SSC. The proposed LTF sites are not located within a documented 100-year floodplain (John C. Stennis Space Center, 1992).

3.4.13.4 Water Quality

Based on various site investigations conducted within the SSC area, no groundwater contamination has been identified beneath the proposed LTF site or surrounding areas (EDAW, Inc., 1998b). Groundwater quality within the SSC area is generally considered good (Stennis Space Center, 1998).

Surface water analysis performed by the U.S. Geological Survey has indicated that the water in area freshwater streams is generally soft and slightly acidic (5.0 to 7.0 pH units), with low concentrations of dissolved solids. However, dissolved solids concentrations in the nearby Pearl and Jourdan rivers frequently increase with the movement of saltwater during high tide. Water quality in the SSC area is similar to the regional surface water quality but is typically more alkaline (7.0 to 8.0 pH units) (John C. Stennis Space Center,

1992). The waters of the nearby Pearl and Jourdan river systems are generally of good to excellent quality and are classified as supporting recreational uses and fish and wildlife.

3.4.14 SSC ENVIRONMENTAL JUSTICE

For a description of EO 12898 and the methodology used for this analysis, see section 3.1.14.

A census tract is considered disproportionate under either of these two conditions: (1) the percentage of persons in low-income or minority populations in the census tracts exceeds the percentage in Hancock County, Mississippi and St. Tammany Parish, Louisiana, the region of comparison, or (2) the percentage of low-income or minority populations in the census tracts exceeds 50 percent. Data for each census tract were compared to data for the regional political jurisdiction surrounding the tract. For this analysis, the region of comparison SSC was defined as Hancock County and St. Tammany Parish. Therefore, Hancock County and St. Tammany Parish were used as the ROI for the environmental justice analysis. Based on the 1990 Census of Population and Housing, Hancock County had a population of 31,760. Of that total, 7,061 persons, or 22.72 percent, were low-income, and 3,764 persons, or 11.85 percent, were minority. St. Tammany Parish had a population of 144,508. Of that total, 19,546 persons, or 13.72 percent, were low-income, and 20,566 persons, or 14.23 percent, were minority.

Hancock County is subdivided into six census tracts, of which four have a disproportionate percentage of low-income or minority populations (or both). St. Tammany Parish is subdivided into 33 census tracts, of which 16 have a disproportionate percentage of low-income or minority populations (or both). These census tracts have been determined to have disproportionate low-income and/or minority populations, and therefore may be subject to environmental justice impacts.

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4.0 Environmental Consequences

4.0 ENVIRONMENTAL CONSEQUENCES

This section describes the potential environmental consequences of the proposed activities by comparing these activities with the potentially affected environmental components. Sections 4.1 through 4.4 provide discussions of the potential environmental consequences of these activities. The amount of detail presented in each section is proportional to the potential for impacts. Sections 4.5 through 4.11 provide discussions of the following with regard to proposed LTF activities: environmental effects of the No-action Alternative; adverse environmental effects that cannot be avoided; relationship between short-term uses of the human environment and the maintenance and enhancement of long-term productivity; irreversible or irretrievable commitment of resources; compatibility with Federal, state, and local land-use plans, policies, and controls for the area concerned; energy requirements and conservation potential; natural or depletable resource requirements and conservation potential.

To assess the potential for and significance of environmental impacts from the proposed LTF activities, a list of activities necessary to accomplish the Proposed Action and alternatives was first developed (section 2.0). Next, the environmental setting was described, with emphasis on any special environmental sensitivity (section 3.0). The Proposed Action was then compared with the potentially affected environment at each location to determine the environmental impacts of the proposed LTF activities. Table 2-12 is a summary of the potential environmental impacts.

Proposed activities were also reviewed against existing environmental documentation on current and planned actions and information on anticipated future projects to determine the potential for cumulative impacts.

4.1 CAPE CANAVERAL AS

4.1.1 CAPE CANAVERAL AS AIR QUALITY

4.1.1.1 Environmental Effects

Impacts to air quality due to the Proposed Action would occur during construction and operation of both the PTC Complex and the I&T Complex. Potential mishaps are also considered.

Construction

Construction activities would be a source of dust (particulate matter with a mean aerodynamic diameter of a nominal 10 micrometers, or PM-10) emissions and exhaust emissions. Dust emissions are primarily a product of ground disturbance. Levels of dust generated would change through time depending on the level and type of ongoing construction activity, weather conditions, and soil types being disturbed. Exhaust emissions would also vary through time depending on construction activity levels. Most

construction-related emissions would have a transient, localized impact on air quality (i.e., once construction ceases, pollutant emissions cease, and air quality returns to its prior state). However, ozone precursors have a delayed impact that results in a wider area of potential impact over a more extended period of time. All other potential pollutants would tend to dissipate within a few miles of the source and would be anticipated to have no measurable impact to air quality beyond this distance.

The proposed construction would require the disturbance of up to approximately 20 hectares (50 acres). Potential fugitive dust and exhaust pollutant emissions were estimated using the Air Quality Thresholds of Significance spreadsheets (Sacramento Metropolitan Air Quality Maintenance District, 1997). It was assumed grading would be completed during the first 12 months and all construction would be completed within 30 months. Table 4.1.1-1 presents the estimate of potential construction emissions at Cape Canaveral AS. The emissions estimate includes the emissions that would result from the construction of both the PTC and I&T Complexes as well as the construction laydown area.

Table 4.1.1-1: Potential Construction-related Emissions at Cape Canaveral AS

Pollutant	Year One[1] – Metric Tons (Tons)	Year Two – Metric Tons (Tons)	Year Three[2] – Metric Tons (Tons)
Carbon Monoxide	14.04 (15.48)	14.04 (15.48)	7.02 (7.74)
Oxides of Nitrogen	18.95 (20.89)	18.95 (20.89)	9.47 (10.45)
Oxides of Sulfur	1.01 (1.11)	1.01 (1.11)	0.50 (0.55)
PM-10	115.21 (127.00)	1.90 (2.10)	0.95 (1.05)
Reactive Organic Gases[3]	6.30 (6.94)	6.30 (6.94)	3.15 (3.47)

Source: Derived from Sacramento Metropolitan Air Quality Management District, 1997.

[1]Emissions estimate includes all fugitive dust emissions due to grading.

[2]Emissions during year three are limited to six months of construction.

[3]Reactive Organic Gases are similar to Volatile Organic Compounds (VOC), but include additional gases. It is used here as a conservative estimate of VOC emissions.

PM-10 = particulate matter with a mean aerodynamic diameter of a nominal 10 micrometers

Specific facility design has not progressed to the point where it is practical to predict maximum construction-related ambient levels of PM-10 or exhaust products. However, construction of the LTF would be carried out using standard construction methods, including normal dust suppression measures, appropriate for this size construction project. As such, while construction activities would be expected to cause increases in air pollutants, it is anticipated that these emissions would not cause exceedances of the NAAQS or state AAQS beyond the bounds of the construction area. In addition, construction activity levels in the area would be managed so as to maintain compliance with OSHA workplace health standards.

Dust suppression methods could include periodic watering of exposed soils, chemical stabilization of inactive areas, and wind breaks to reduce wind speed and consequent

entrainment of dust. Proper tuning and preventative maintenance of construction vehicles would serve to minimize exhaust emissions and maximize vehicle performance. (U.S. Environmental Protection Agency, 1999c)

Operation

Daily operation of the PTC Complex and I&T Complex would result in an increase in air pollutant emissions. The increase would come from various maintenance activities including setup for non-hot flow testing, site maintenance, and periodic operation of the backup generators.

All stationary sources of air pollution emissions within the PTC and I&T Complexes would be incorporated into the Cape Canaveral AS Title V Air Permit. Activities at the site would be typical of an administrative or light-industrial research center. No additional primary power sources or full-time boilers would be required for normal daily operations within the complexes. No large-scale surface-coating (painting) operations or sandblasting would be conducted at either complex. It is anticipated that the emissions could be incorporated into the site Title V Air Permit through an administrative change. A change of this type could probably be accomplished in less than 3 months. Depending on final mission usage levels, it is possible that the installation of the backup generators, PRS, and PRS boilers could require a re-negotiation of the Title V and PSD analysis. If this is the case, it could require a year or more to complete the permitting process.

The Proposed Action requires the installation of three 750-kilowatt diesel generators as backup power sources. As stationary sources, these generators would be incorporated into the Cape Canaveral AS Title V Air Permit. Table 4.1.1-2 indicates the anticipated annual emissions from these generators assuming each is operated 500 hours per year.

Table 4.1.1-2: Anticipated Backup Generator Emissions[(1)]

Pollutant	Potential Annual Emissions[(2)] in Metric Tons Per Year (Tons Per Year)
Carbon Monoxide	3.76 (4.15)
Oxides of Nitrogen	16.42 (18.10)
Oxides of Sulfur[(3)]	5.53 (6.10)
PM-10	0.27 (0.30)
Volatile Organic Compounds	0.48 (0.53)
Hazardous Air Pollutants	$<$0.01 ($<$0.01)

Source: U.S. Environmental Protection Agency, 1999b.

[(1)]Assumes 500 hours of operation per year per generator

[(2)]Assumes the installation of three 750-kilowatt generators

[(3)]Assumes 1 percent sulfur by weight

PM-10 = particulate matter with a mean aerodynamic diameter of a nominal 10 micrometers

Assuming all project-related traffic is new traffic and that it all passes Gate 1, the Proposed Action would be expected to result in less than a 3 percent increase in daily traffic use. As noted in section 4.1.11, the area has plans to repave the roadway to six lanes, which demonstrates the area is anticipating further growth. As such, it is reasonable to assume the level of traffic increase that would be caused by the Proposed Action would not cause detrimental impacts to the area's air quality.

Laser testing is the proposed activity that would result in the greatest rate of air pollutant emissions. Before actual hot-flow testing, the PRS boilers (diesel-fueled) would be required to heat the water to the required temperature. During the actual laser test, the PRS would generate less than 3 minutes of exhaust and could result in the operational emission of up to 9.5 kilograms (21 pounds) of hydrogen fluoride along with approximately 57,000 liters (15,000 gallons) of water (56,538 kilograms [124,950 pounds]).

It is anticipated that up to approximately 13,250 liters (3,500 gallons) of diesel fuel would be combusted to heat the PRS boilers for each laser test, with a maximum of 16 tests per year. Addition of air pollution control technology to the diesel boilers would reduce the level of emissions. Specific potential reductions would depend on the type of controls installed. Table 4.1.1-3 summarizes the potential emissions due to this amount of diesel fuel use with no pollution controls installed. Operation of the boilers would be incorporated into the Cape Canaveral AS Title V Air Permit and would incorporate appropriate operational restrictions in order to protect the current air quality. Construction permits would be required prior to the installation of the boilers, but no additional PSD analysis requirements are anticipated.

Table 4.1.1-3: Projected Diesel-fueled Boiler Emissions[1]

Pollutant	Emissions Per Test[2] in Kilograms (Pounds)	Annual Emissions[3] in Metric Tons (Tons)
Carbon Monoxide	8 (18)	0.13 (0.14)
Nitrogen Oxides	32 (70)	0.51 (0.12)
Sulfur Oxides[4]	229 (502)	3.65 (4.02)
PM-10	2 (4)	0.02 (0.03)
Aldehydes	<1 (<1)	<0.01 (<0.01)

[1] Emissions derived used factors presented in the Compilation of Air Pollutant Emission Factors Volume I - Stationary sources, section 1.3 (U.S. Environmental Protection Agency, 1999a)
[2] Assumes 13,250 liters (3,500 gallons) of diesel fuel combusted per test
[3] Assumes 16 tests per year
[4] Assumes a sulfur content of 1 percent by weight
PM-10 = particulate matter with a mean aerodynamic diameter of a nominal 10 micrometers

The PRS generates superheated steam that in turn generates the vacuum used to draw the reactants through the laser generator and through the chemical scrubber. The scrubber is rated at 95 percent efficiency and other lasers with similar scrubbers report actual efficiencies in the 99 percent range. This analysis uses the rated efficiency and as such it

is probable that actual concentrations and potential impacts due to exhaust components will be less than those described here.

As noted above, the exhaust cloud consists primarily of superheated steam. As such, it will tend to rise and drift with the wind while expanding (and diluting). While expanding, it will continue to rise until it has cooled to ambient temperatures at which point its altitude will have stabilized. After that point, the exhaust cloud would continue to expand due to atmospheric turbulence and wind action until it has diluted to the point where it has been entrained into the ambient atmosphere. This is not to say the cloud will be visible the entire time. Once the steam has cooled, probably within minutes of being exhausted, there will be no visible sign of its passage.

The chemical of concern in the exhaust stream is hydrogen fluoride, a hazardous air pollutant. Using the rated efficiency of 95 percent and all tests are of maximum duration, each test run could result in the operational emission of no more than 9.5 kilograms (21 pounds) of hydrogen fluoride. This would be ejected as a gas along with approximately 57,000 liters (15,000 gallons) of water as steam. Hydrogen fluoride would tend to remain in a gaseous state unless subjected to meteorological conditions of humidity greater than 90 percent and temperatures less than 50 degrees F. As such, it is not expect to deposit out of the cloud as a separate pollutant, but would remain within the cloud as it expanded. Once the cloud expanded to the point where it was contacting the ground, the hydrogen fluoride would likely be adsorbed into any wet surfaces or surface water with which it came into contact. Once entrained in water, it would not be likely to re-volatize and as such would be effectively removed from the exhaust cloud.

The potential for exposure to hydrogen fluoride was determined using the U.S. EPA-approved screening model, TSCREEN/PUFF. This model uses conservative estimates of wind speed and atmospheric mixing heights in order to determine the maximum possible exposure to a chemical release. The model also conservatively neglects positive buoyancy, which results in the model predicting higher concentrations closer to the source. The maximum 15-minute exposure concentration at or beyond the laser safety zone was calculated to be less than 1.5 milligrams per cubic meter. This level is less than both the OSHA Short-Term Emergency Exposure Limit of 5.0 milligrams per cubic meter and the OSHA Permissible Exposure Level of 2.5 milligrams per cubic meter (Van Nostrand Reinhold, 1996). Since the area within the Laser Safety Zone would be evacuated prior to any laser test, it is not anticipated that the general public, on-base personnel, or operations personnel would be exposed to potentially harmful levels of hydrogen fluoride due to the Proposed Action.

Table 4.1.1-4 compares current emissions at Cape Canaveral AS with the anticipated emissions due to the proposed operations of the PTC and I&T Complexes.

Table 4.1.1-4: Comparison of Current and Proposed Annual Emissions at Cape Canaveral AS

Pollutant	Annual Emissions in Metric Tons (Tons)		
	Current Emissions[1]	LTF-related Operations Emissions[2]	Total Projected Annual Emissions
Carbon Monoxide	249.02 (274.5)	3.89 (4.29)	252.91 (278.79)
Oxides of Nitrogen	347.31 (382.9)	16.93 (18.22)	364.24 (401.12)
Oxides of Sulfur	93.08 (102.6)	9.18 (10.12)	102.26 (112.72)
PM-10	68.49 (75.5)	0.29 (0.33)	68.78 (75.83)
Volatile Organic Compounds	94.71 (104.4)	0.48 (0.53)	95.19 (104.93)
Hazardous Air Pollutants	17.79 (19.61)	<0.01 (<0.01)	17.79 (19.61)

[1]Stationary sources only. Source: U.S. Air Force, 1997.
[2]Includes backup generator emissions (table 4.1.1-2) and PRS boiler emissions (table 4.1.1-3)
PM-10 = particulate matter with a mean aerodynamic diameter of a nominal 10 micrometers

Mishap Impacts

In addition to the operational exhaust of hydrogen fluoride, it is also possible that one or more of the reactants to be stored at the PTC Complex could leak or be accidentally released into the atmosphere. The two chemicals of concern due to potential toxicity would be nitrogen trifluoride and fluorine. Up to approximately 3,184 kilograms (7,020 pounds) of nitrogen trifluoride and 10 kilograms (22.5 pounds) of fluorine would be stored at the PTC Complex (see table 2-2).

Reactant transfer operations (refilling storage tanks or transferring the reactants into the test equipment) are activities that would result in the highest probability of an accidental release. Transfer operations would be remotely controlled where possible, and personnel directly involved (such as those conducting the transfer from delivery vessels to storage vessels) would follow established operating procedures and wear appropriate personal protection equipment. Accidental releases due to transfer operations would probably be limited to a few ounces of reactant, which would be dispersed before reaching the edge of the safety area.

However, the potential does exist for a serious mishap involving the release of a larger portion of a stored reactant. As such, meteorological monitoring and dispersion modeling would be carried out prior to initiating any transfer operations. If the modeling indicated the potential for hazardous conditions beyond the Laser Safety Zone, transfer of the reactant would be delayed until conditions changed sufficiently that modeling indicated a release would not result in hazardous conditions beyond the Laser Safety Zone.

In addition to the chance of an accidental release occurring during reactant transfer operations, there is the remote possibility of an accidental release occurring at other times. It is possible that a release could occur of sufficient magnitude that under the proper

meteorological conditions it could present a serious health hazard beyond the Laser Safety Zone. The duration of the health hazard would be limited to the amount of time required for the cloud to disperse. Specific times and distances would depend upon meteorological conditions, the type of chemical and amount released, and the rate of release (see appendix D). As with other industrial facilities that utilize hazardous chemicals, the appropriate steps to be carried out in the event of a chemical release would be included in the facility Risk Management Plan. It would include steps to be taken in order to minimize the impact such an accidental release could have on people and on the environment. The Risk Management Plan would be developed in coordination with the proper agencies.

4.1.1.2 Cumulative Impacts

No other concurrent construction projects have been identified. However, the dust generated during construction would add to any generated in the immediate vicinity of the construction site. All applicable construction permits would be obtained and adhered to. As such, no exceedance of air quality standards or health-based standards of non-criteria pollutants would be anticipated.

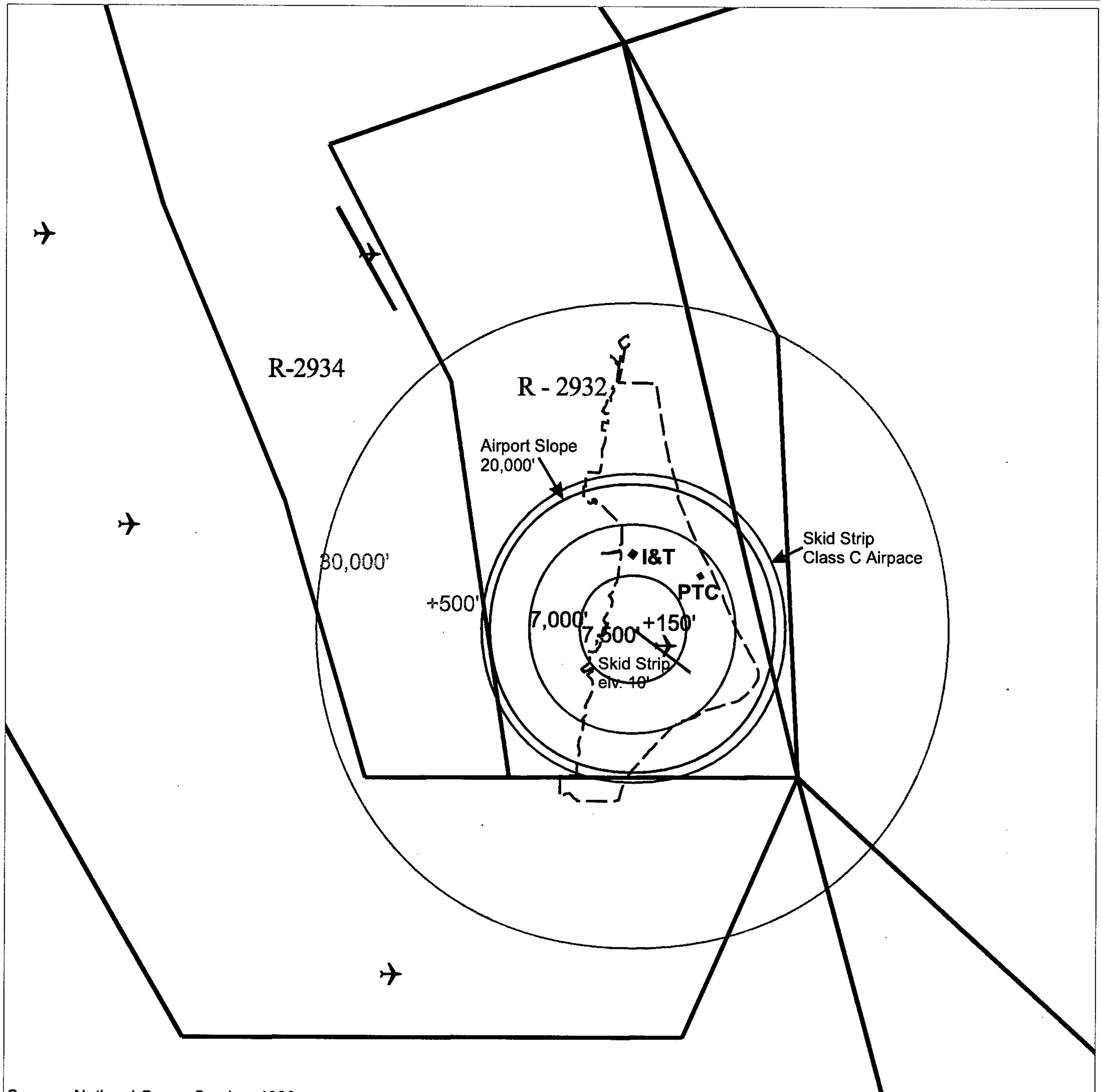
Daily operations would add to the area's ambient pollution levels. Stationary sources, including backup generators and the PRS boiler, would be incorporated into the Cape Canaveral AS Title V Air Permit. No PSD analysis requirement is anticipated. The addition of less than 250 vehicle trips per day as anticipated in the proposed action would not be expected to have any noticeable cumulative impact to the area's air quality.

Proposed testing would result in the operational release of up to approximately 9.5 kilograms (21 pounds) of hydrogen fluoride. The emission of hydrogen fluoride would be incorporated in the Cape Canaveral AS Title V Air Permit and would have a negligible cumulative impact when considered with other toxic pollutants covered by the same permit.

4.1.2 CAPE CANAVERAL AS AIRSPACE

4.1.2.1 Environmental Effects

This section summarizes the results of applying the obstruction standards contained on FAA Form 7460-6, Obstruction Evaluation Worksheet. It is assumed that the facilities at the PTC and I&T Complexes would be approximately 61 meters (200 feet) AGL and would require a Notice of Proposed Construction. In addition, based on the 100 to 1 slope criteria from the Skid Strip, facilities at the PTC Complex that exceed 35 meters (114 feet) and facilities at the I&T Complex that exceed 31 meters (101 feet) would require a Notice of Proposed Construction (figure 4.1.2-1).



Source: National Ocean Service, 1999a.

EXPLANATION

- LTF Facilities
- Installation Boundary
- Airport
- Airport Slope Notice Criteria
- Military Airport Surface
- Restricted Airspace

NORTH

Scale 1:200,000

0 2.5 5 Kilometers

0 1.6 3.2 Miles

Cape Canaveral Military Airport Surfaces View

Figure 4.1.2-1

as_cc_01

A three-dimensional surface, based on FAA regulations, was generated for the Skid Strip. The proposed facilities at the PTC and I&T Complexes do not exceed the height of the Military Airport Imaginary Surface and therefore would not exceed the obstruction standards.

Operation of the LTF would not affect restricted airspace R-2932, located above the LTF facilities.

4.1.2.2 Cumulative Impacts

No other activities that would impact airspace have been identified at the proposed LTF locations. The submittal of the required Notice of Proposed Construction, and adherence to any determinations made by the FAA, would preclude the potential for cumulative impacts to existing airspace users.

4.1.3 CAPE CANAVERAL AS BIOLOGICAL RESOURCES

The analytical approach for determining effects to biological resources involved quantifying and evaluating the degree to which the proposed LTF activities could impact vegetation, wildlife, threatened or endangered species, and sensitive habitats within the ROIs. Impacts that could result from proposed construction activities include vegetation disturbance and disturbance or displacement of wildlife from the accompanying noise and presence of personnel. Impacts could also result from noise and emissions during testing of the RD vehicle.

Criteria for assessing potential impacts to biological resources are based on the number or amount of the resource that could be impacted relative to its occurrence at the project sites, the sensitivity of the resource to proposed activities, and the duration of the impact. Impacts are considered significant if they have the potential to result in reduction of the population size of Federally listed threatened or endangered species, degradation of biologically important or unique habitats, substantial long-term loss of vegetation, or the capacity of a habitat to support wildlife. Consultation with applicable USFWS offices was initiated to address potential impacts to threatened and endangered species. Based on this initial Section 7 consultation, additional study and analysis would be required if Cape Canaveral AS is selected as the preferred alternative.

4.1.3.1 Environmental Effects

The following sections discuss the environmental effects of the Proposed Action on biological resources found at Cape Canaveral AS.

Construction

The proposed Cape Canaveral AS alternative includes constructing the PTC at LC-15, potential use of existing facilities in the vicinity of Building 54445, and constructing the

I&T Complex south of Building 54445 (figure 2-6). LC-15 is a previously disturbed launch area. Vegetation is mainly coastal dune, scrub, and strand, and maritime hammock. Although removal of this vegetation could displace wildlife such as the beach mouse and gopher tortoise, it would not result in a substantial reduction in habitat available for wildlife in the area. No threatened or endangered plant species are expected to be affected by construction activities; however, a survey would need to be performed. Any vegetation impacts associated with clearing areas that could be potentially used by Florida scrub jays would be in compliance with the Cape Canaveral AS Integrated Natural Resources Management Plan. Although wetlands are located adjacent to the construction laydown area, they would be avoided, and construction would not result in the loss or disturbance of any wetlands.

No construction would occur in sea turtle nesting habitat. Construction is expected to occur during daylight hours, thus impacts on adult turtles attempting to come ashore would be minimal. If nesting occurs in an area likely to be affected, adequate protection measures will be employed to minimize the potential for disturbance. These can include buffer zone establishment and protective posting of sites. These measures will have little mitigative effect on noise disturbance, but should prove effective in minimizing disruptive factors. The negative effects of beachfront lighting on nesting female sea turtles and their hatchlings are well documented. Since sea turtles nest at night, artificial lighting in coastal areas may disrupt visual cues and may deter female turtles from coming ashore to nest. In addition, artificial lighting is known to disrupt the seaward orientation of hatchlings. Sea turtle hatchlings are easily misdirected to artificial light sources, and move in circular paths when confronted by several light sources. Because of increasing coastal development, mortality associated with hatchling disorientation due to artificial lighting is also increasing. At this time, it is not known what lighting would be required for support of the program. Lighting will, however, be kept to the absolute minimum required and will comply with the 45 SW Policy on Exterior Lighting to minimize impacts to sea turtle hatchlings and adults.

Construction noise may disturb wildlife in the immediate vicinity during the construction period. Since there are no absolute standards of short-term noise impacts for potentially noise-sensitive species, a short-term maximum noise exposure of 92 dB has been suggested as a significance cut-off for impacts (U.S. Army Strategic Defense Command, 1990; 1989). This noise level is equivalent to being 1 meter (3 feet) from a power lawnmower. Typically the noise at 15 meters (50 feet) from a construction site does not exceed an equivalent sound level of 90 dBA. Most of the noise and human activity would be caused by truck traffic to and from the construction site and the use of heavy machinery and excavation equipment. If construction occurs during the winter months, wintering shorebirds may be disturbed. Construction activities could also disturb nesting, hatching, and fledging of land and shorebirds, sea turtles, and other wildlife in the area. No bald eagle nests occur in areas likely to be disturbed by construction activities. The combination of increased noise levels and human activity would likely displace some small mammals and cause birds, including eagles or other listed bird species, that may be foraging in the area to temporarily avoid the area within approximately 15 meters (50 feet) of the site. Some wildlife may leave the area permanently, while others may likely become accustomed to the increased noise

and human presence. Although the initial flushing would slightly increase the energy expenditure, additional foraging habitat occurs in the vicinity.

No impacts to the Canaveral National Seashore or critical manatee habitat are anticipated as a result of construction activities.

Operation

Approximately sixteen 60-second laser tests would be performed each year. The PRS that generates the noise would operate for 120 to 200 seconds per test. Noise levels from these tests would be approximately 125 dB at approximately 15 meters (50 feet) from the end of the PRS ejector. Assuming no intervening structures or vegetation, the noise would attenuate to approximately 93 dB at a distance of approximately 0.6 kilometer (0.4 mile). Wildlife within this area could potentially be affected.

Many studies have addressed noise and disturbance to various species of birds, including several Federally threatened or endangered species. The following is a summary of applicable studies. The USFWS and the Florida Department of Natural Resources (1992) describe the potential effects of human disturbance on birds and stress that there is great variation among and within species. Potential negative effects of disturbance on nesting raptors include temporary nest abandonment, allowing exposure of eggs or young to excess heating or cooling, reduced reproductive performance, aerie abandonment, accidental death of young due to premature fledging, and other short-term behavior responses. Female hawks left nests when they experienced shock waves, but returned to the nest within 10 minutes. Anderson et al. (1986) reported that red-tailed hawks shift their activity center away from areas of high human activity, but return after the human activity ceases.

At KSC, a rookery, used by wood storks and other species of wading birds, is located approximately 750 meters (2,461 feet) from a launch pad. This rookery continues to be used successfully, although a decline in black mangrove habitat due to non-operational factors has reduced wood stork use and nesting success (American Institute of Aeronautics and Astronautics, 1993).

Also, birds within 250 meters (820 feet) of Titan launch complexes at Cape Canaveral AS have shown no mortality or reduction in habitat use. It was also reported that scrub jays subjected to noise levels of up to 145 to 160 dB were not affected. However, at Cape Canaveral AS, Titan launches may have caused a temporary hearing or behavioral change in scrub jays within the 95 dB contour (U.S. Department of the Air Force, 1990). Type 1 and 2 Titan IV vehicles produce noise levels of approximately 170 dB in the immediate vicinity of the launch pad. This attenuates to 125 dB at a distance of 3 kilometers (2 miles) within about 30 seconds following launch. Two scrub jays in the near-field (within 5 kilometers [3 miles]) area east of LC-41 did not respond to warning calls shortly after launch. Following the launch of Shuttle mission 34, however, scrub jays west of the pad displayed normal behavior and responded to calls. (U.S. Department of the Air Force, 1990)

Due to the short duration of the test noise (approximately 120 to 200 seconds), the only individuals that would likely be affected are those that are within the peak 93 dB and greater noise contours, approximately 644 meters (2,112 feet) from the PRS. Birds that are early in the nest initiation/egg laying and fledgling stages would have the greatest chance of being affected. While adults are away from the nest, eggs and young could potentially be exposed to increased predation and effects of weather. The effects of weather would be minimized by not conducting tests during the mid-day heat. Previous studies of jet aircraft noise have indicated that as long as noise levels drop to ambient levels and no other disturbance occurs, most birds return to nests within only a few minutes. The nearest rookery for colonial nesting birds is located west of LC-15 outside of the 93 dB noise contour and would not be adversely affected. During the winter, foraging shorebirds would be subjected to increased energy demands if they are flushed by the noise, but this would be a short-term, minimal effect. Most species also appear to be more easily startled in circumstances involving sight of an object, such as a plane, combined with the noise caused by such an object. Testing of the laser element would not result in this more intense reaction.

Launch-related noise from Space Shuttle and Titan launches has not had a substantial effect on wildlife on or near the launch complexes (U.S. Department of Transportation, 1996). Overall, the level of noise impacts resulting from RD vehicle testing is expected to only have minimal effect on listed species for the following reasons:

- Shorebirds, eagles, and other raptors that regularly use habitats along the shores of Cape Canaveral AS already experience regular loud jet aircraft flying nearby and launch noise and may not react strongly to this short-term test event.
- Human activity before the test would likely cause birds and other mobile wildlife species to leave the area before the test, reducing the number of individuals that would be exposed to the loudest noise levels.
- Only 16 tests per year are anticipated.
- The noise level would return to near ambient levels within 120 to 200 seconds.

Impacts of lighting on nesting female sea turtles and their hatchlings are discussed under Construction.

The component of the exhaust stream that is of concern to biological resources is the hydrogen fluoride. Using the rated scrubbing rate and the maximum test duration, each test could result in the operational release of no more than 9.5 kilograms (21 pounds) of hydrogen fluoride along with the 57,000 liters (15,000 gallons) of water exhausted as superheated steam. Using the U.S. EPA-approved screening model, TSCREEN/PUFF, it was calculated that the maximum instantaneous concentration of hydrogen fluoride would be 6.27 milligrams per cubic meter (7.6 parts per million). As noted in section 4.1.1, this model uses conservative measures to obtain the highest possible concentrations. Actual concentrations are anticipated to be significantly lower than those predicted through modeling (due to variations in weather and the initial buoyancy of the exhaust cloud).

The hydrogen fluoride would be emitted as a gas and would remain a gas unless exposed to meteorological conditions of humidity greater than 90 percent and temperatures less than 50 degrees F. Under these more extreme circumstances the hydrogen fluoride could be converted into particles. However, even as a particulate, the hydrogen fluoride would still have a small size and would tend to act as PM-10 and remain in the exhaust cloud. In either form the hydrogen fluoride would tend to be adsorbed into any water source with which it came in contact as the cloud dispersed. Under normal circumstances the cloud would be highly dispersed before coming into contact with the ground and as such deposition of hydrogen fluoride in any given area would be extremely low and would have minimal impact on surface water pH levels.

As an example, we assume the maximum instantaneous airborne concentration noted above (6.27 milligrams per cubic meter) is deposited on a 1-meter square area of water with a pH of 7 and an alkalinity of 25 milligrams per liter (calcium oxide equivalent). Further assuming the deposited hydrogen fluoride reacted with only the first 3 inches of water, the total volume of water in the reaction would be 75 liters (20 gallons). The total available alkalinity would be approximately 1,890 milligrams calcium oxide. Only 3.15 milligrams of the 1,890 milligrams would be required to neutralize the 6.27 milligrams of hydrogen fluoride deposited in this example. Therefore, there would be negligible loss of alkalinity, and the overall pH of the system would have a negligible change due to LTF testing.

In systems with low mixing dynamics (slow current or no flow) it is possible that a thin acid layer would temporarily form over a more basic layer. If it occurred, this layering effect would be transitory and would be lessened by water flow or animal movements in the water.

Under rainy conditions, it is possible that the exhaust could be deposited in a smaller area, resulting in a greater amount of hydrogen fluoride in any given area. However, rain levels sufficient to wash the hydrogen fluoride from the exhaust cloud would also serve to dilute the acid and mitigate its impact on surface waters. Wind levels during such rain events would also serve to disperse the hydrogen fluoride even as the rain serves to concentrate it. The base pH of the rain would further serve to buffer any system to which the hydrogen fluoride is introduced. Rain has a pH range of approximately 4-8 under normal circumstances and the addition of the small amount of hydrogen fluoride would likely cause a negligible change in the pH of the rainfall. As such, hydrogen fluoride that is adsorbed into rain would not be likely to have a measurable impact.

In a 1934 study on the toxicity effects of hydrogen fluoride on animals, no deaths occurred in animals exposed to 1,200 ppm of hydrogen fluoride for 30 minutes (American Industrial Hygiene Association, 1988). Concentrations below 120 ppm were tolerated for 5 hours with no deaths by rabbits and guinea pigs (American Industrial Hygiene Association, 1988). The estimated maximum ground level concentration of hydrogen fluoride within a cubic meter is predicted to be 7.6 ppm. The length of exposure to the hydrogen fluoride cloud is anticipated to be less than 5 minutes, which further reduces actual impacts. No adverse effects to wildlife species, such as birds flying through the

steam and hydrogen fluoride cloud, are expected as a result of this level of hydrogen fluoride emission.

As discussed earlier, accidental releases of hazardous materials due to transfer operations would probably be limited to a few ounces of reactant, which would be dispersed before reaching the edge of the safety area. However, the potential does exist for a serious mishap involving the release of a larger portion of a stored reactant. As such, meteorological monitoring and dispersion modeling would be carried out before initiating any transfer operations. The facility's Risk Management Plan would include steps to be taken in order to minimize the impact such an accidental release could have on people and on the environment. The Risk Management Plan would be developed in coordination with the proper agencies.

4.1.3.2 Cumulative Impacts

The addition of 16 tests per year to the current Cape Canaveral AS project schedule has the potential to result in cumulative impacts to wildlife in the area from elevated noise levels and toxic emissions. However, according to KSC, studies of wildlife impacts have not identified any productivity limiting response to launch noise, and observation has shown that response to high noise levels is short-term and has not caused significant impacts (National Aeronautics and Space Administration, 1992). Prescribed burning is required to maintain scrub jay habitat. Because of current missions on Cape Canaveral AS, the ability to conduct burns is presently hindered. The LTF program could potentially exacerbate this problem. If this site were selected, further consultation with the USFWS would be required prior to any ground disturbance. The addition of 16 discrete events could result in cumulative impacts.

4.1.4 CAPE CANAVERAL AS CULTURAL RESOURCES

4.1.4.1 Environmental Effects

Prehistoric and Historic Archaeological Resources

There are no National Register-listed or -eligible archaeological sites within either the direct ground disturbance areas for LTF or the ESQD around LC-15. As a result, no effects on historic properties are expected to occur.

However, because archaeological sites and artifacts are known to occur within the boundary of the installation, there is some potential for cultural materials to be unexpectedly discovered during the course of project activities. In the event this should occur, all activities would halt in the immediate area and the Florida SHPO would be consulted through the Patrick AFB Environmental Office. Subsequent actions would follow guidance provided in 36 CFR 800.11 and/or in NAGPRA.

Historic Buildings and Structures

LC-15 and all associated support facilities have been evaluated for inclusion in the National Register and determined to be ineligible (New South Associates, 1996). Therefore, there would be no historic properties effects on LC-15 from the proposed demolition and construction of the LTF complex at the LC-15 site. The use of Building 54445 for LTF activities is still uncertain, and the facility has not been evaluated for eligibility for inclusion in the National Register. However, if the facility is utilized, there are no requirements for modifications. Therefore, there would be no effects on historic properties.

LC-14, which is a component of the Cape Canaveral AS National Historic Landmark District, is located within the LTF 549-meter (1,800-foot) ESQD. Therefore, there is a remote possibility that damage could occur to LC-14 in the event of an unexpected explosion at the LTF (see section 4.1.4.3).

Mitigation measures to offset potential effects on LC-14 from an unexpected explosion at LC-15 are not proposed because the probability of such an occurrence is low and the cost of mitigation (e.g., Historic American Building Survey/Historic American Engineering Record recordation) is high. In the unlikely event that a mishap occurs, post-mishap recommendations include post-event inspection, non-archival quality 35-millimeter photography, and site record/National Historic Landmark documentation revisions to determine and record the extent of the damage from impacts or fire.

Native Populations/Traditional Resources

There are no National Register-listed or -eligible traditional cultural properties within either the direct ground disturbance areas for LTF or the ESQD around LC-15. As a result, no effects on historic properties are expected to occur.

4.1.4.2 Cumulative Impacts

The only reasonably foreseeable future program identified for the Cape Canaveral AS area is the Evolved Expendable Launch Vehicle Program. The program ROI does not overlap with the LTF program; therefore, no cumulative impacts are expected to occur.

4.1.5 CAPE CANAVERAL AS GEOLOGY AND SOILS

4.1.5.1 Environmental Effects

Construction

Construction activities typically involve the removal of vegetation, cut-and-fill operations, and grading for site preparation and access. Depending on the specific geologic conditions at the proposed LTF sites, ground disturbing construction activities could result in a potential for ground instability including temporary and localized occurrences of wind and water erosion. No unique geologic features that could be affected by project construction are known to exist at the project site.

As previously discussed in section 2.1.1.2, site preparation activities at Cape Canaveral AS would result in the disturbance of more than 2 hectares (5 acres) of land and, therefore, would be subject to NPDES construction permit requirements. These requirements call for implementation of an SWPPP, which would identify the Best Management Practices to be implemented both during and following construction activities for the purpose of preventing soil erosion and controlling pollutant discharges into waterways during storm events. Best Management Practices often include the construction of berms, swales, and runoff diversion ditches, hydroseeding, and the use of silt fences or separators. With implementation of the SWPPP and Best Management Practices, the erosion of soil resulting from project construction would be minor and short-term in nature.

As discussed in section 2.1.1.2, construction activities would be required to comply with the SPCC Plan that would be developed and implemented as part of this project. The SPCC Plan would provide resources and guidelines for use in the control, cleanup, and emergency response for spills of hazardous material or waste. In the event that release of hazardous material or waste would occur, affected areas would be treated in accordance with applicable Federal, state, and local regulations. Therefore, the risk of accidental spills of hazardous chemicals during project construction affecting project soils is expected to be minor and temporary in duration.

Operation

The physical structure or chemical composition of soils at Cape Canaveral AS could potentially be affected by soil contamination from deposition of airborne emissions generated during laser operations and the accidental release of hazardous materials. As discussed in section 2.1.1, hydrogen fluoride would be the primary pollutant generated during operational tests of the laser. A scrubber on the PRS would remove approximately 95 percent of the pollutants from the waste stream before discharging the residuals to the atmosphere. Upon discharge to the atmosphere, only small amounts of hydrogen fluoride deposition are expected because hydrogen fluoride disperses rapidly in the air due to the relatively low weight and size of hydrogen fluoride particles. However, under limited atmospheric conditions, such as a relative humidity of greater than 90 percent and an ambient air temperature of less than 10°C (50°F), the deposition of small quantities of hydrogen fluoride onto nearby soils could occur (U.S. Army Space and Missile Defense Command, 1998).

In general, the effects of hydrogen fluoride deposition are related to decreased soil pH. The acidity or alkalinity of a soil is often referred to as soil reaction (measured in units of pH) and is a common indicator used in describing impacts to soil quality. In general, soil pH is representative of the soil's hydrogen ion concentration and is expressed in units ranging from 0 to 14. As the concentration of hydrogen ions in the soil increases, soil pH decreases and becomes more acidic. A soil pH of 7 is considered neutral. Decreasing pH values from 7 to 0 indicate increasing acidity, and from pH 7 to 14 indicate increasing alkalinity.

Because emission residuals would be treated to reduce hydrogen fluoride concentration, the deposition of hydrogen fluoride on nearby soils would be minimal. Soils in the area of

LTF operations are generally slightly acidic to alkaline (average pH levels range from approximately 6.6 to 8.4) and exhibit moderate to high levels of permeability (Iowa State University Statistical Laboratory, 1998). Due to the natural buffering capacity of the soils, the deposition of small amounts of hydrogen fluoride would result in only minor and temporary decreases in soil pH. Because hydrogen fluoride deposition on soil surfaces would occur primarily during periods of high humidity and because hydrogen fluoride is highly soluble in water, small amounts of hydrogen fluoride residuals would be quickly diluted and buffered by rainfall. LTF operations are not expected to result in long-term changes in the chemical composition or physical characteristics of soils located within the project's ROI.

As previously mentioned, the risk of accidental releases of hazardous materials or wastes is considered minimal. All activities conducted on the project site would be required to comply with the SPCC Plan, to be developed and implemented as part of this project. Compliance with the SPCC Plan would minimize the potential for accidental spills of hazardous chemicals to affect project soils.

Because Cape Canaveral AS is located in a low seismic risk area, the potential for liquefaction, seismic settlement, or ground rupture at the project sites is considered minimal. In addition, soils at the LTF sites exhibit low shrink/swell susceptibility. As a result, potential geotechnical problems associated with the LTF sites are considered minor.

4.1.5.2 Cumulative Impacts

Temporary, minor impacts to geology and soils, when combined with other current and foreseeable future activities, would not result in cumulative impacts.

4.1.6 CAPE CANAVERAL AS HAZARDOUS MATERIALS AND HAZARDOUS WASTE MANAGEMENT

The primary hazardous materials and the hazardous wastes associated with LTF operation and maintenance are listed in table 2-6.

4.1.6.1 Environmental Effects

As part of ongoing activities, the soil contamination at LC-15 will be removed before the LTF is constructed. Groundwater contamination in the area will be undergoing remediation and will be managed by Cape Canaveral AS independently of LTF activities. Therefore, construction and operation of the LTF at Cape Canaveral AS would result in no additional environmental effects associated with the site's contamination.

Construction of LTF would generate hazardous materials such as motor fuels, waste oils, paints, and solvents. All hazardous waste generated by the construction contractor remains the property of the U.S. Air Force. The individual contractor or operator must follow all procedures listed in Operational Plan 19-14 as well as all State and Federal

Regulations. The Contract Monitor is responsible for contacting ESC for the turn-in of hazardous wastes to the Air Force permitted facility. In addition, demolition of structures with ACM has a potential for releasing asbestos fibers into the air. Asbestos fibers could be released due to disturbance or damage of various building materials such as pipe and boiler insulation, acoustical ceilings, sprayed-on fireproofing, and other material used for soundproofing or insulation. Testing for ACM is necessary if the absence of asbestos cannot be verified. Similarly, suspected lead-based paints and PCBs encountered during any demolition would require testing and special handling. Paints that exceed the limits for lead must be removed in accordance with the applicable health and safety standards and disposed of as hazardous waste. PCB-contaminated equipment must be either retrofilled (PCB equipment containing greater than 499 ppm will not be retrofilled) with non-PCB dielectric fluid and the PCB-contaminated fluid disposed of as PCB waste, or the entire piece of equipment must be disposed of as PCB waste. Depending on the concentrations, typical PCB waste disposal may be by incineration or landfilling in a specially permitted facility. PCB removal and retrofill would be coordinated through the ESC office.

The operation and maintenance of the LTF at Cape Canaveral AS would increase the amounts of hazardous materials used and hazardous wastes generated at Cape Canaveral AS. These hazardous materials and hazardous wastes, listed in table 2-6, are similar to those currently being used at Cape Canaveral AS. Any new materials associated with the LTF may require modifications to existing permits. To accommodate increased quantities of hazardous waste, additional 90-day storage areas and satellite stations may be required. These facilities would be operated in accordance with O-Plan 19-14 and coordinated with the ESC. If the LTF is not going to manage their hazardous waste under the current Cape Canaveral AS U.S. EPA ID number, RCRA requires that as a generator of hazardous waste, the LTF would be require a U.S. EPA ID number. All waste generated by the LTF would be stored, transported, and disposed of under this number. Otherwise, procedures, personnel, and facilities are in place to manage these additional hazardous materials and wastes generated by the LTF construction and operation.

The proposed LTF would be designed from the start to eliminate potential sources of pollution. The facility would address affirmative procurement to the maximum extent feasible. The use of recycled construction materials would be maximized. Any waste generated by construction and operation would be recycled to the maximum extent possible. Pollution prevention efforts as defined by Cape Canaveral AS's Pollution Prevention Management Plan would apply to LTF activities. The processes involved with the operation and maintenance of the LTF would be evaluated to eliminate the use of hazardous chemicals/materials to the maximum extent feasible to reduce or eliminate potential sources of pollution. A turnkey rag recycling program would be initiated to reduce the volume of waste rags produced by operation of the LTF facility. Rooms and laboratories for storage or use of hazardous materials would be constructed to contain spills. Any underground or aboveground storage tanks associated with LTF construction or operation would be subject to regulation under F.A.C. 62-761.

4.1.6.2 Cumulative Impacts

The additional quantities of hazardous materials or hazardous wastes, when added to existing and expected future programs, would not adversely affect existing permits or programs at Cape Canaveral AS. Therefore, cumulative impacts relative to hazardous materials or hazardous wastes are not expected.

4.1.7 CAPE CANAVERAL AS HEALTH AND SAFETY

4.1.7.1 Environmental Effects

Construction

Few existing structures would be used at LC-15. Where existing structures are used, an affirmative action would be made to determine the presence of ACM and lead-containing paint. If determined to be present, ACM and lead-containing paint would be removed before other renovation activities are initiated. Preparation for new construction would include clearance of existing vegetation, grading, and excavation for foundations. Construction equipment laydown, personal vehicle parking, temporary mobile offices (trailers), maintenance facilities, and other construction needs would occur within the construction laydown area. Excavation for foundations and footings present hazards from loose, unconsolidated soils and high water tables. Trucks would operate in accordance with DOT and Cape Canaveral AS regulations. The tall structures proposed for this action present fall hazards during construction. Construction activities would be conducted in accordance with OSHA, Air Force, and USACE requirements for health and safety to control exposure to occupational safety and health hazards.

Operations—General Considerations

The RD vehicle would be operated in test conditions designed to simulate the rigors of space, including high vacuum, thermal loading from insolation, and electromagnetic radiation. The acoustic shock of launch would be simulated in the Acoustic Test Cell Facility. Hazards to LTF employees would include noise from equipment operation, including the PRS vacuum pumps, diesel generators, and acoustic shock transducers; hazardous chemicals; electromagnetic radiation from EMI/EMC testing; fall hazards associated with tall structures and high bay work areas; and material handling hazards associated with cranes and hoists.

Three zones would be established to provide for the safety of facility operators and other people not associated with the LTF: the PTC Complex, an ESQD, and a Laser Safety Zone. The PTC Complex comprises an area of approximately 6 hectares (15 acres) and contains the PTC, the PRS, the Reactant Storage and Handling Area, and other facilities. This area would be fenced, with limited access. An inhabited building ESQD is established at 550 meters (1,800 feet) to preclude inhabited building development in this area. The Laser Safety Zone is established at 1.2 kilometers (0.75 mile). All non-essential personnel would be excluded from the Laser Safety Zone during operations involving risk of an

explosion, including transfer of hydrogen and deuterium, pressurization of the steam storage tank, and testing.

Hazardous chemicals, including fluorine and nitrogen fluoride, and compressed gases at high pressure, including hydrogen, deuterium, and helium, would be stored in the Reactant Storage and Handling Areas. The storage area for these hazardous materials would be protected by an appropriate fire suppression system meeting National Fire Protection Association and DOD requirements. There is a potential for accidental release of toxic and corrosive gases, including fluorine and nitrogen trifluoride, from the tube tanks of the delivery vehicles, during transfer from the delivery vehicles to the site storage tanks, and during conveyance from the site storage tanks to the laser combustor. Existing operating procedures and safety measures have been established to minimize the probability of such a release and the potential for health and safety impacts (Eastern and Western Range 127-1, "Range Safety Requirements, and 45 SW Operational Plan 32-1, Volume II, and 32-3, Volume I). Specific LTF procedures would also be established.

Reaction products from the combustor are fed to the optical resonator, where further reactions produce hydrogen fluoride and deuterium fluoride. Exhaust gases from the optical resonator would be released through the PRS where the very water-soluble gases are scrubbed. Because a vacuum is maintained in the test cell during laser testing, the reactants would only be released through the PRS. The vacuum inside the test cell ensures no personnel would be inside the cell to be exposed to hazardous chemicals or laser radiation during testing. The PRS is a multistage steam ejector pumping system that would react fluorine and nitrogen trifluoride in the exhaust gas to hydrogen fluoride and deuterium fluoride and nitrogen. The condensing steam will capture the hydrogen fluoride and deuterium fluoride to produce hydrofluoric acid, reducing the amount of hydrogen fluoride discharged to the atmosphere with at least 95 percent efficiency. The hydrofluoric acid would be neutralized with sodium hydroxide, producing sodium fluoride. A personnel exclusion zone would be established for a 100-meter (328-foot) radius around the discharge from the PRS to prevent hazardous exposures to personnel. Additionally, all personnel would be outside the Laser Safety Zone during laser testing. The Air Force, the USACE, and OSHA have adopted the American Conference of Governmental Industrial Hygienists threshold limit value® of 1 ppm for fluorine, 3 ppm for hydrogen fluoride, and 10 ppm for nitrogen trifluoride.

The dispersion of the exhaust emission from the PRS would be modeled for meteorological conditions. When modeling indicates the concentration of hydrogen fluoride exceeds the exposure criterion of 3 ppm at the boundary of the Laser Safety Zone, the test would be delayed until more favorable meteorological conditions prevail.

Facility and equipment designs would incorporate measures to minimize the potential for and impact of accidental releases. Operating procedures and training would be instituted to minimize the potential for and impact of releases of hazardous materials. Appropriate emergency response plans would be established and implemented to deal with potential chemical releases.

Acoustic testing would be conducted in the Acoustic Test Cell Facility, outside the Laser Safety Zone. The Acoustic Test Cell is a reinforced concrete structure that would limit the noise exposure to LTF employees. No personnel would be inside the acoustic test cell during acoustic testing.

Electromagnetic interference and compatibility testing would be conducted in the EMI/EMC Test Area Facility outside the Laser Safety Zone. The EMI/EMC testing would be conducted in the shielded enclosure to prevent electromagnetic fields and radiation exposure to personnel.

Operations—Cape Canaveral AS

Operations in the PTC Complex would have potential health and safety impact on other activities at Cape Canaveral AS. The 550-meter (1,800-foot) ESQD encompasses portions of LC-14 and LC-16. Operations at LC-14 and LC-16 within the ESQD would not include inhabited buildings.

The Laser Safety Zone with a 1.2-kilometer (0.75-mile) radius around the PTC Complex would be activated up to 16 times per year for a duration of about 2 hours each time. The pressurization of the steam storage tank would take place during this period, and the ESQD associated with the pressurization would be contained within the Laser Safety Zone. The Laser Safety Zone fully encompasses LC-14 and LC-16 and significant portions of LC-13 and LC-19. Operations at LC-13, LC-14, LC-16, and LC-19 would have to be suspended and personnel evacuated when the Laser Safety Zone is active.

The dispersion of the exhaust emission from the PRS would be modeled for meteorological conditions before each test. When modeling indicates the concentration of hydrogen fluoride would exceed the exposure criterion of 3 ppm at the boundary of the exclusion zone, the test would be delayed until more favorable meteorological conditions prevail.

Facility and equipment designs would incorporate measures to minimize the potential for and impact of accidental releases. Operating procedures and training would be instituted to minimize the potential for and impact of releases of hazardous materials. Appropriate emergency response plans would be established and implemented to deal with potential chemical releases.

4.1.7.2 Cumulative Impacts

All work on the Proposed Action would be performed in accordance with applicable health and safety regulations. No injuries or illnesses are anticipated. No other activities have been identified within the ROI that when combined with the Proposed Action would have a cumulative impact on health and safety.

4.1.8 CAPE CANAVERAL AS LAND USE AND AESTHETICS

4.1.8.1 Environmental Effects

Regional Land Use

The proposed project would be located in the northeast section of Cape Canaveral AS with the Atlantic Ocean to the east and the Banana River to the west. Construction and operational activities would not affect adjacent offsite land uses. No noise related impacts on adjacent land use are anticipated because noise should be below background noise levels at the 1.2-kilometer (0.75-mile) Safety Zone radius. See section 4.1.9 for additional noise information.

On-base Land Use

Construction and operation activities associated with the PTC Complex would occur primarily at LC-15, and the I&T Complex in the vicinity of Building 54445. The PTC Complex would require approximately 6 hectares (15 acres) and the I&T Complex approximately 10 hectares (25 acres). Up to 20 hectares (50 acres) could be disturbed during the construction phase, which includes a 4-hectare (10-acre) construction laydown area along the road to the PTC Complex. A portion of the proposed area for the I&T Complex has been previously disturbed. This site had two office modules and a picnic pavilion, but they have been removed.

Proposed PTC Complex land uses would fall into the launch operations land use category and the I&T Complex would fall into the launch and range support category according to the Base Comprehensive Plan. Although the PTC Complex use is not a launch facility, the facility and site operations (including the inhabited building ESQD and the Laser Safety Zone) would be compatible with the open nature of the launch operations land use category and existing types of activities, and is consistent with the Base Comprehensive Plan. The proposed facilities and operations would not result in a conversion of prime agricultural land or cause a decrease in the utilization of the land. The I&T Complex and associated activities would be compatible with the launch and range support category and the Base Comprehensive Plan. However, some conflicts have been identified related to prescribed burning management, as discussed in section 4.1.3, Biological Resources.

The ESQD and the Laser Safety Zone would restrict the use of two launch complexes adjacent to LC-15 and limit the use of two additional launch complexes during times of testing. These launch complexes are currently inactive except for storage and office functions occurring in the usable structures. Likewise, personnel at the LTF would be evacuated during launch activities at other complexes, such as CX 36. The Laser Safety Zone will have no impact on the use of beaches at Cape Canaveral AS because they are already restricted to the public. However, adjacent use of the ocean for recreational activities does fall within the Laser Safety Zone (Cape Canaveral Air Station, 1992). Special provisions would have to be made for the use of these areas. Portions of the ocean area that fall within the Laser Safety Zone would have to be closed during times of testing. This could be accomplished by adjusting the procedures already in place for shuttle and missile launches.

Coastal Zone Management

LC-15 does not lie within the FCMA no development zone, therefore construction and modification of facilities is consistent with the FCMA. All siting guidelines would be adhered to by coordinating all designs with 45 SW Civil Engineering. However, LC-15 does lie within a coastal zone and is subject to Federal coastal zone consistency determination, which is administered by the FDCA. The proposed LTF's effects on the coastal zone have been evaluated based on the Florida Coastal Management Program enforceable policies, statutes, and regulations and determined to be consistent to the maximum extent practicable (Florida Department of Community Affairs, 1997). If Cape Canaveral is selected, the Air Force would prepare a Coastal Zone Consistency Determination for the LTF and support facilities and submit it to the FDCA for review.

Aesthetics

New construction would slightly alter the views surrounding Cape Canaveral AS. Several of the proposed facilities would stand approximately 61 meters (200 feet) tall, and although different than the existing launch facilities, they would not be out of character for the area because some of the existing structures and launch complexes are similar in height, color, and shape. Views of Cape Canaveral AS are all distant views and are primarily limited to marine traffic to the east and west and distant offsite beach areas and small communities to the south. Therefore, construction and operations of the proposed LTF would result in minor effects on the area's aesthetic quality, and would not obstruct any scenic views.

4.1.8.2 Cumulative Impacts

In terms of potential for cumulative impacts, the proposed PTC Complex site is currently used as an inactive launch facility. It was originally dominated by vegetation indigenous to the Florida coastal dune, coastal strand, or coastal scrub plant communities until 1957 when the complex was built for the Titan I missile program. Approximately 70 percent of Cape Canaveral AS has been retained in a near natural state, and many areas that were previously disturbed by human settlement have reverted to this natural state (Cape Canaveral Air Station, 1992). The conversion of LC-15 to accommodate the LTF and the construction of support facilities would not create a cumulative change.

The additional closure time of the adjacent launch complexes and ocean area due to LTF testing would not significantly add to the amount of time that this area is closed for other missions. Construction of the I&T Complex would affect a very small portion of the base on previously disturbed land and would not contribute to any cumulative land use impacts.

The proposed LTF program along with the Evolved Expendable Launch Vehicle Program, which is to convert another inactive launch facility to meet its needs, would not contribute to any cumulative land use impacts.

4.1.9 CAPE CANAVERAL AS NOISE

4.1.9.1 Environmental Effects

There are no legally established national standards for noise exposure outside of the work environment. Therefore, limits on workplace noise are used as guidelines for exposure of public to noise.

The Occupational Safety and Health Act of 1970 (Public Law 91-596) was established to "assure safe and healthy working conditions for working men and women." It delegated implementation and enforcement of the law to OSHA. Protection of workers from potentially hazardous occupational noise exposure is provided in 29 CFR 1910.95 of the law. OSHA regulations require employees exposed to 8-hour time-weighted average levels of noise of 85 dBA and 90 dBA to be monitored and to be provided hearing protection, respectively. For noise levels greater than 90 dBA, hearing protection is required for exposures of shorter duration (table 4.1.9-1). Under OSHA regulations, exposure to impulse noise should never exceed a 140 dB peak sound pressure level.

Table 4.1.9-1: Permissible Workplace Noise Exposure*

Duration (Hours per Day)	Sound Level dBA Slow Response
8	90
6	92
4	95
3	97
2	100
1 to 1.5	102
1	105
0.5	110
0.25 or less	115

Source: 29 CFR 1910.95, Table G-16

* Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.

Potential impacts from LTF program activities could come from noise generated by construction equipment during construction activities and from noise generated by the PRS during operational activities.

Ignoring the effects of terrain and atmospheric attenuation, noise attenuates by 6 dB for every doubling of distance. For distances greater than approximately 300 meters (1,000 feet), the effects of atmospheric attenuation start to become important. While atmospheric attenuation is frequency dependent (Cowan, 1994), for the purposes of this analysis an average non-frequency dependent value of 1 dB per 304.8 meters (1,000 feet) is used below.

Construction

At a distance of approximately 15 meters (50 feet) the noise from typical construction equipment falls in the range of 70 dBA to 100 dBA (with peak noise from pile drivers going as high as 110 dBA) (U.S. Environmental Protection Agency, 1971). As such, under most meteorological conditions, all construction noise would be anticipated to attenuate to 85 dBA at a radius of approximately 270 meters (890 feet) from the construction site. As no point on the Cape Canaveral AS facility boundary is anticipated to be closer than this, then no noise impacts to the public from construction noise would be anticipated.

Operation

While it is operating, the PRS is anticipated to generate a noise level of approximately 125 dB at a distance of 15 meters (50 feet) from the end of the PRS ejectors. Assuming no attenuation due to intervening structures or vegetation, the noise from such a source would attenuate to approximately 85 dB at a radius of approximately 1.0 kilometers (0.64 mile). As this would be within the 1.2-kilometer (0.75-mile) Laser Safety Zone, no impacts to the noise environment would be anticipated from the operation of the PRS. This is especially true because operation of the PRS would be only a few minutes duration approximately 16 times per year.

The PRS would be built such that the ends of the ejectors are not aligned in the direction of known noise sensitive receptors. Noise barriers, such as walls or groups of trees, could also be placed between the ends of the PRS ejectors and noise sensitive receptors to further reduce the potential for impacts.

4.1.9.2 Cumulative Impacts

Noise impacts for Cape Canaveral AS would include those from current programs and those expected from LTF activities. Most of these noises are intermittent and are not expected to cumulatively impact the area.

4.1.10 CAPE CANAVERAL AS SOCIOECONOMICS

4.1.10.1 Environmental Effects

For the purposes of this EA, the Proposed Action is divided into two components: the construction phase and the operational phase. The economic impacts of these phases have been measured using a development impact model (Urban Land Institute, 1997). The model uses employment and income multipliers generated by the U.S. Bureau of Economic Analysis, Regional Input-Output Modeling System.

Construction

The Proposed Action would begin with a construction phase. The construction program would draw on local resources including labor and material. It is estimated that the total

construction cost of the buildings required at Cape Canaveral AS, including labor and materials, would be about $101.2 million.

The construction phase would generate about 1,260 full-time equivalent construction jobs that would create $31.1 million in wage income. This wage income would translate into personal consumption expenditure within the ROI of about $25.2 million. In addition, the construction program would require the purchase of raw materials and finished building products. It is estimated that these purchases would equal about $42.5 million, a quarter of which would be made in the region.

These jobs and expenditures would be substantial, yet transitory, benefits for the local economy. The result of the construction program, however, would be an operational facility that would generate recurring economic benefits.

The construction phase, because it would be carried out away from inhabited areas, would not be expected to effect the quality of life of local residents or visitors to Cape Canaveral.

Operation

The first phase of the Proposed Action would create a maximum of approximately 91 new, direct, operational jobs in the region. These jobs would generate approximately $3.48 million of direct income annually. This income, in turn, would translate to $2.82 million of personal consumption. Every dollar earned directly by the operational complement would create indirectly, or induce, further jobs and expenditures in the local economy. These indirect and induced jobs and earnings would be generated in a variety of forms, whether in local restaurants, gas stations or shops or even among the manufacturers of products that would service the day-to-day needs of the operational team. This trickle-down phenomenon is termed the multiplier effect. It is calculated that a total of 350 jobs and $7.47 million of annual household income would be created directly by the action and indirectly in the local economy via the multiplier effect.

The second phase of the Proposed Action would require 170 personnel. If these jobs were new to the local economy they would generate $5.26 million of direct consumption expenditure, 654 direct and indirect jobs and $13.94 million of direct and indirect annual household income.

The creation of these new jobs could have the potential to increase demand for new homes and local services, including health, education and other publicly-provided facilities. If every job created by the Proposed Action brought with it a typical U.S. household (2.64 persons in 1997), then 91 first phase jobs would bring 240 people and 170 second phase jobs, 449. If all of those moving into the area came from outside of the regional economy, then the population of the region would increase by a maximum of less than 0.1 percent. The current forecast increase in population between 1997 and 2005 (based on existing demographic trends) is about 37,500. The potential increase in population

attributed to this action would, therefore, require an increase of the forecast by about 1.2 percent.

Operational impacts on the quality of life would be minimal due to the relative isolation of the LTF site at Cape Canaveral and the non-invasive character of the Proposed Action.

4.1.10.2 Cumulative Impacts

The local and regional growth forecasts imply that the additional jobs created in the community would not add significantly to the existing trends.

The positive monetary impacts of the Proposed Action would help sustain current economic growth plans and forecasts for the region.

4.1.11 CAPE CANAVERAL AS TRANSPORTATION

4.1.11.1 Environmental Effects

Roadways

During the LTF construction phase, total anticipated vehicle trips per day would be as follows: 800 vehicle trips per day and 10 truck trips per day, with a peak of 50 truck trips per day. Operations traffic would generate approximately 240 vehicle trips per day and 1 truck trip per day.

Phillips Parkway, along with Titan Road (in the Building 54445 area) and ICBM Road, accessing LC-15, are the primary roads potentially affected by LTF activities. The 1996 annual ADT for SR-401 (which becomes Phillips Parkway) just south of Gate 1 show 7,600 northbound vehicles and 8,200 southbound vehicles per day. At construction levels, project demands would amount to an increase in traffic of 5.3 percent northbound and 4.9 percent southbound. In addition, 1996 figures indicate that Phillips Parkway had an 8,000 vehicle per hour capacity with a peak per hour volume of 1,900 vehicles (U.S. Air Force, 1998).

Although a significant amount of traffic utilizes SR-401 and SR-405 during peak hours, these roadways have sufficient capacity to handle their volume (Cape Canaveral Air Station 45th Space Wing, 1996). SR-520 was projected to function below the Florida DOT minimum LOS by 2005, and plans for its resurfacing as a six-lane have been included in the Brevard 2010 *Cost Feasible Plan* (U.S. Air Force, 1997). Due to continued area growth, SR-528 traffic volumes are projected to triple by 2010. However, environmental constraints (particularly crossing the Indian River lagoon, an Estuary of National Significance) preclude its widening.

Transportation of hazardous material would be accomplished in accordance with DOT regulations for interstate shipment of hazardous substances (49 CFR 100-199).

Waterways

The distance from the proposed LTF site to the dock facilities is 8.9 kilometers (5.5 miles). Access and facilities at Port Canaveral are more than adequate to meet project-related demands. Barge transport of the RD vehicle at the conclusion of the test program would be accommodated using existing facilities with minimal impact.

Railways

A rail spur is available approximately 4.8 kilometers (3 miles) from the PTC Complex, and use approximately three times per year for shipping and receiving LTF-related components would result in minimal impacts.

Airways

Project-related requirements for airways would include use for shipping and receiving LTF-related components approximately three times per year. The Class B Skid Strip Airfield, augmented by facilities at Patrick AFB and (for civilian traffic) Brevard County, offers more than adequate air services for Cape Canaveral AS.

4.1.11.2 Cumulative Impacts

No transportation impacts are expected outside of Cape Canaveral AS boundaries. Roadways used to travel to and from proposed LTF sites have sufficient carrying capacity or would be upgraded to handle the increase in traffic. Cumulative impacts are expected to be non-existent or minimal, with no anticipated degradation of transportation quality or increase in travel time. No other programs have been identified that, when combined with LTF-related transportation impacts, would contribute to cumulative impacts to transportation.

4.1.12 CAPE CANAVERAL AS UTILITIES

4.1.12.1 Environmental Effects

Water Supply

A permit would be required to connect to the existing 46-centimeter (18-inch) potable water line located 1,219 meters (4,000 feet) away from LC-15. Well water could be used in case of emergency, but only after adequate treatment (Cape Canaveral Air Station 45th Space Wing, 1996).

Water requirements during the LTF construction period, for general activities and dust control, are listed in table 2-3. The LTF average daily water requirement during construction would be 1.2 percent of the current Cape Canaveral AS average daily use. Combining LTF usage and Cape Canaveral usage would result in a total usage of 26 percent of available water supply.

Monthly water requirements for LTF operations are listed in table 2-4. Monthly LTF demand would amount to 1.0 percent of the average demand level and would result in a combined usage of 26 percent of the total available water supply.

The annual water usage would increase as indicated, but at present, the City of Cocoa's water supply to Cape Canaveral AS is more than sufficient to handle the increase. If warranted, water could also be delivered from Melbourne. Current sources of water are sufficient to meet demands of the proposed project.

Wastewater

During construction for the LTF, a temporary concrete batch plant would be erected at the site, and water from the plant would be captured and collect in a retainment or detainment pond (depending upon the requirements of the site). Wastewater would be treated and disposed of in accordance with existing permit limitations.

Wastewater treatment is adequate near Building 54445 to meet LTF requirements of 26,498 liters (7,000 gallons) per day, with a 95-liter (25-gallon) per minute diurnal demand, but would necessitate upgrading via connection from the 10-centimeter (4.0-inch) force main to the existing 10-centimeter (4-inch) force main at Hanger Road and Phillips Parkway, 10,363 meters (34,000 feet) away. This would require a permit; an industrial wastewater permit would also be needed. LTF would have to provide its own sewage treatment if effluent is other than ordinary sewage (EDAW, Inc., 1998a).

WWTP capacity is 3,028,320 liters (800,000 gallons) per day, with a current daily flow of 870,000 liters (230,000 gallons) per day. Project demands would require a package dual grinder pump station with 246-liter (65-gallon) per minute pumps at a 4.6-meter (15-foot) head.

Estimated wastewater from LTF construction activities is listed in table 2-3. Given 250 working days per year, this WWTP's capacity would be 757 million liters (200 million gallons). Maximum annual LTF wastewater demands during construction would be 0.024 percent of this capacity and a 0.8-percent increase over current use. Annual wastewater levels from LTF operations would be approximately 0.4 percent of the available capacity.

Solid Waste

Various types of solid waste/construction debris will be generated during the LTF construction phase. Where practicable, this waste would be recycled. The construction contractor will handle removal of construction debris; unused cut and fill material would be transported from the project area to an approved spoil site.

The total construction waste is estimated to be 1,360 metric tons (1,500 tons).

Monthly levels of solid waste produced during LTF operations are listed in table 2-4. Given the Central Disposal Facility's maximum demand of 2,177 metric tons (2,400 tons)

daily x 20 working days per month (or 43,545 metric tons [48,000 tons] monthly), this would amount to 0.1 percent over current demand, well within system capacity.

Additional demands on Cape Canaveral AS solid waste disposal resulting from proposed project demands and personnel increases would be negligible.

Energy

Though transmission lines are sufficient, existing substations at Building 54445 are currently inadequate for 15 mVA and would need upgrading (EDAW, Inc., 1998a) by connecting to the 115 kV transmission lines located close to the North Substation. This would require 3 kilometers (2 miles) of new 115 kV transmission lines, a new 115 kV to 13.2 kV substation, and 1.2 kilometers (0.75 miles) of new, underground 15-kV lines.

Monthly electricity demand for LTF operations is listed in table 2-4. Assuming 20 working days per month, LTF electricity demands during operation would be 1.45 percent of current demand and would result in a total usage of 0.4 percent of available capacity. These additional demands on the Cape Canaveral AS electrical systems by the Proposed Action would be negligible.

LTF natural gas demands during operation would be 0.04 percent of Brevard County's current capacity; capacity figures for the new Cape Canaveral AS pipeline along Phillips Parkway are not currently available.

4.1.12.2 Cumulative Impacts

Proposed project activities should have minimal to no impacts outside of Cape Canaveral AS facilities and no cumulative impacts are anticipated. The increase in personnel is not expected to appreciably impact the facilities of either Cape Canaveral AS or surrounding communities, such as Cocoa and Melbourne. No other programs have been identified that, when combined with LTF-related utilities requirements, would contribute to cumulative impacts.

4.1.13 CAPE CANAVERAL AS WATER RESOURCES

4.1.13.1 Environmental Effects

Construction

Construction-related impacts to water resources would be related to sedimentation from erosion. Potential impacts associated with erosion and sedimentation include a reduction of basin or channel volumes and reduced availability of dissolved oxygen within receiving waters.

Site preparation activities at Cape Canaveral AS would be as described in section 2.1.3 and would result in the disturbance of more than 2 hectares (5 acres) of land and,

therefore, would be subject to NPDES construction permit requirements. An SWPPP would be developed to identify the Best Management Practices to be implemented both during and following construction activities for the purpose of preventing soil erosion and controlling possible pollutant discharges into waterways during storm events.

Within the State of Florida, storm water management activities are also governed by the Florida ERP program. Under the ERP program, a permit application would be developed and submitted to initiate concurrent review by the FDEP and the USACE. The FDEP utilizes the ERP application for the review of State of Florida storm water management requirements, as an application for use of state owned submerged lands, and for ensuring compliance with state water quality standards. The ERP also serves as an application to the USACE for Federal dredge and fill permitting review; however, it is not anticipated that wetlands would be affected by LTF activities.

Compliance with the NPDES SWPPP and State of Florida storm water management requirements would minimize soil erosion and pollutant discharges during construction. In addition, compliance with the SPCC Plan would minimize the potential for accidental spills of hazardous chemicals to affect surface and groundwater resources.

Operation

Potential impacts to surface and ground water quality resulting from LTF operations could result from either the deposition of airborne emissions generated during laser operations, the accidental release of hazardous materials, and the discharge of wastewater effluents. As discussed in section 2.1.1, hydrogen fluoride would be the primary pollutant generated during operational tests of the laser. A scrubber on the PRS would remove approximately 95 percent of the pollutants from the waste stream before discharging the residuals to the atmosphere. Upon discharge to the atmosphere, hydrogen fluoride disperses rapidly due to the relatively low weight and size of hydrogen fluoride particles. However, under limited atmospheric conditions when the relative humidity is greater than 90 percent and ambient air temperatures are less than 10°C (50°F), the deposition of small quantities (0.086 gram per square meter) of hydrogen fluoride onto the nearby ground and water surfaces may occur (U.S. Army Space and Missile Defense Command, 1998). Depending on the buffering capacity of the receiving water, the deposition of small amounts of hydrogen fluoride may result in a temporary increase in surface water acidity. Under most conditions, the deposition of small amounts of hydrogen fluoride into surface waters would be quickly neutralized by the buffering capacity (alkalinity) of the receiving waters and would not be considered harmful (Agency for Toxic Substances and Disease Registry, July 1998).

Surface waters near Cape Canaveral AS are slightly acidic to alkaline. Average pH levels range from a low of approximately 6.9 in Banana River to a high of nearly 7.6 in Mosquito Lagoon (National Aeronautics and Space Administration, 1998). Due to the natural buffering capacity of these surface waters, the deposition of small amounts of hydrogen fluoride are anticipated to result in only minor and temporary decreases in water pH. Small amounts of hydrogen fluoride deposited on water surfaces would quickly dissipate due to surface water mixing and the natural buffering capacity of the nearby surface waters.

The risk of accidental releases of hazardous materials or wastes is considered minimal. All activities conducted on the project site would be required to comply with the spill prevention and containment measures contained within the SPCC Plan, to be developed and implemented as part of this project. Compliance with the SPCC Plan would minimize the potential for accidental spills of hazardous chemicals to affect surface and groundwater resources.

Operations at Cape Canaveral AS, including the proposed LTF sites, would be required to comply with NPDES industrial permit requirements and the Cape Canaveral AS *Storm Water Pollution Prevention Plan*. The Cape Canaveral AS *Storm Water Pollution Prevention Plan* was prepared to support a NPDES multi-sector industrial storm water permit. Discharges of treated wastewaters are regulated by the St. Johns River Water Management District for compliance with Federal and State of Florida water quality standards. Any change in design, construction, operation, or maintenance of facilities that result in an increase of pollutant discharge to State waters would require application for a NPDES permit (or amendment of an existing applicable permit) and potential revisions to the SWPPP. Operation of the proposed facility would require an amendment of the existing NPDES multi-sector permit for inclusion of wastewater discharges associated with the operation of the proposed facilities. Compliance with NPDES requirements and the SWPPP would minimize pollutant discharges during project operations.

EO 11988 directs Federal agencies to "avoid to the extent possible the long- and short-term adverse impacts associated with occupancy and modification of floodplains..." The areas proposed for LTF activities are located within previously constructed areas that are currently elevated above the 100-year floodplain. However, because average surface elevations are low (approximately 3 meters [10 feet] above msl), the LTF areas may be subject to flooding from storm surge tides. Potential impacts to the LTF from storm surge tides would be considered in the design. Although construction and operation of the proposed facilities would occur within an area that would be subject to storm surge tides, the LTF would not noticeably increase the potential for floods and no adverse impacts to water quality or quantity are expected.

4.1.13.2 Cumulative Impacts

No other activities that would impact water resources have been identified at the proposed LTF locations. No future programs have been identified that when combined with the Proposed Action would contribute to cumulative water resources impacts.

4.1.14 CAPE CANAVERAL AS ENVIRONMENTAL JUSTICE

4.1.14.1 Environmental Effects

EO 12898 requires that Federal agencies identify and address disproportionately high and adverse environmental effects (including human, health, and economic and social effects) of its programs, policies, and activities on minority and low-income populations. An environmental justice impact would be a long-term health, environmental, cultural, or

economic effect that has a disproportionately high and adverse effect on a nearby minority or low-income population, rather than all nearby residents. The potential for a disproportionately high and adverse effect could occur under either of two conditions: (1) the percentage of persons in low-income or minority populations in the census tracts exceeds the percentage in the county, the region of comparison, or (2) the percentage of low-income or minority population in the census area exceeds 50 percent.

Construction and operation of the LTF at Cape Canaveral AS would not disproportionately affect any minority or low-income populations. The potential environmental or human health impacts noted above would be contained within the Cape Canaveral AS boundary and would not impact any populated areas. No Native American or traditional cultural resources would be impacted from LTF construction and operation.

4.1.14.2 Cumulative Impacts

No other projects or activities in the region along with LTF have been identified that would contribute to potential cumulative environmental justice impacts.

4.2 KENNEDY SPACE CENTER

4.2.1 KSC AIR QUALITY

4.2.1.1 Environmental Effects

Potential impacts to the air quality at KSC due to the Proposed Action are similar to those described in section 4.1.1 for Cape Canaveral AS.

Construction

Construction activities would continue for a period of up to 30 months and would disturb up to approximately 20 hectares (50 acres). Table 4.2.1-1 presents the estimate of potential construction emissions due to the proposed construction at KSC using the procedure and assumptions outlined in section 4.1.1.

Table 4.2.1-1: Potential Construction-related Emissions at Kennedy Space Center

Pollutant	Year One[1] Metric Tons (Tons)	Year Two Metric Tons (Tons)	Year Three[2] Metric Tons (Tons)
Carbon Monoxide	14.04 (15.48)	14.04 (15.48)	7.02 (7.74)
Oxides of Nitrogen	18.95 (20.89)	18.95 (20.89)	9.47 (10.44)
Oxides of Sulfur	1.01 (1.11)	1.01 (1.11)	0.50 (0.55)
PM-10	73.76 (81.31)	1.90 (2.10)	0.95 (1.05)
Reactive Organic Gases[3]	6.30 (6.94)	6.30 (6.94)	3.15 (3.47)

Source: Derived from Sacramento Metropolitan Air Quality Management District, 1997.
[1]Emissions estimate includes all fugitive dust emissions due to grading.
[2]Emissions during year three are limited to six months of construction.
[3]Reactive Organic Gases are similar to VOCs, but include additional gases. It is used here as a conservative estimate of VOC emissions.
PM-10 = particulate matter with a mean aerodynamic diameter of a nominal 10 micrometers

Specific facility design has not progressed to the point where it is practical to predict maximum construction-related ambient levels of PM-10 or exhaust products. However, construction of the LTF would be carried out using standard construction methods, including normal dust suppression measures, appropriate for this size construction project. As such, while construction activities would be expected to cause increases in air pollutants, it is anticipated that these emissions would not cause exceedances of the NAAQS or state AAQS beyond the bounds of the construction area. In addition, construction activity levels in the area would be managed so as to maintain compliance with OSHA workplace health standards.

Dust suppression methods could include periodic watering of exposed soils, chemical stabilization of inactive areas, and wind breaks to reduce wind speed and consequent

entrainment of dust. Proper tuning and preventative maintenance of construction vehicles would serve to minimize exhaust emissions and maximize vehicle performance. (U.S. Environmental Protection Agency, 1999c)

Operation

Assuming all project-related traffic is new traffic and it all utilizes the Kennedy South Parkway, the proposed action would be expected to result in an average 10 percent increase over current levels, as noted in section 4.2.11. The nearest offsite roadway (NASA Parkway West) would experience less than a 5 percent increase in traffic. Neither of these levels is beyond the anticipated loads for these roadways. As such, it is reasonable to assume the level of traffic increase that would be caused by the proposed action would not cause detrimental impacts to the area's air quality.

Emissions from stationary sources would be incorporated into the site's Title V Air Permit. Emissions due to daily operations would be limited to maintenance-related emissions (including setup for non-laser testing, site maintenance, and periodic operation of the backup generators). It is possible that the installation of the backup power sources, PRS, and PRS boilers could require a re-negotiation of the site Title V Air Permit. If this were determined to be the case, it could take a year or more to finalize the permit.

The emissions due to the proposed operation of three backup 750-kilowatt generators are summarized in table 4.1.1-2.

Each laser test would result in the operational release of less than approximately 9.5 kilograms (21 pounds) of hydrogen fluoride. As indicated in section 4.1.1, these releases would not be expected to cause exceedances of health-based standards beyond the Laser Safety Zone, which would be evacuated prior to operation of the PTC. As such, no operations personnel, base personnel, or members of the general public would be exposed to hazardous levels of hydrogen fluoride due to proposed operation of the PTC.

Table 4.1.1-3 summarizes the projected emissions due to proposed operation of the PRS boilers without the installation of additional air pollution control technology. If additional air pollution control technology were installed, it would allow for reduced emissions from the PRS boilers. Specific possible reductions and the decision as to whether such equipment were installed would depend on the final boiler design. Construction permits would be required prior to the installation of the new boilers. Assuming the total boiler heat output is less than 10 million British Thermal Units (MMBTU), there would be no requirement for additional PSD analysis. If the final facility design requires boilers with a total heat output of more than 10 MMBTU, additional PSD analysis would be required prior to construction.

Table 4.2.1-2 compares current emissions at KSC with the anticipated emissions due to the proposed operation of the PTC and I&T Complexes.

Table 4.2.1-2: Comparison of Current and Proposed Annual Emissions at Kennedy Space Center

Pollutant	Annual Emissions in Metric Tons (Tons)		
	Current Emissions[1]	LTF-related Operations Emissions[2]	Total Projected Annual Emissions
Carbon Monoxide	173.51 (191.26)	3.89 (4.29)	177.4 (195.55)
Oxides of Nitrogen	144.49 (159.27)	16.93 (18.22)	161.42 (177.49)
Oxides of Sulfur	13.01 (14.34)	9.18 (10.12)	22.19 (24.46)
PM-10	291.82 (321.68)	0.29 (0.33)	292.11 (322.01)
Volatile Organic Compounds	189.61 (209.00)	0.48 (0.53)	190.09 (209.53)
Hazardous Air Pollutants	12.79 (14.10)	<0.01 (<0.01)	12.79 (14.10)

[1]Source: Dynamac Corporation, 1997.

[2]Includes backup generator emissions (table 4.1.1-2) and PRS boiler emissions (table 4.1.1-3)

PM-10 = particulate matter with a mean aerodynamic diameter of a nominal 10 micrometers

Mishap Impacts

Potential mishaps and their potential impacts at Kennedy Space Center are similar to those described in section 4.1.1.1. The most likely accidental release would occur during fuel transfer and would be limited to a few ounces of reactant. Due to the greater potential for hazardous releases during refueling, it would only be conducted under meteorological conditions that would not result in hazardous conditions beyond the laser safety zone if a release were to occur. The least likely mishap is one involving the majority of either fluorine or nitrogen trifluoride. If this level of accidental release were to occur under proper weather conditions, it could result in hazardous conditions beyond the laser safety zone (appendix D). The facility Hazardous Management Plan would include the proper responses to accidental releases in order to minimize its impact to the populace and the environment.

4.2.1.2 Cumulative Impacts

The particulate emissions (dust) generated during construction would add cumulatively to those generated by other sources in the area. Potential cumulative sources of particulate emissions would include solid rocket motor exhaust emissions from any motor testing or launches conducted while construction was ongoing. However, it is not anticipated that the cumulative effect of the multiple dust sources would cause an exceedance of the NAAQS or state AAQS.

Daily operations would add to the area's ambient pollution levels. Stationary sources, including the backup generators and PRS boilers, would be incorporated in the KSC Title V Air Permit. No PSD analysis requirement is anticipated. Mobile emissions associated with the Proposed Action would add to the current level of mobile emissions in the area, but an increase of less than 250 vehicle trips per day would not be expected to have a noticeable cumulative impact to the area's air quality.

4.2.2 KSC AIRSPACE

4.2.2.1 Environmental Effects

This section summarizes the results of applying the obstruction standards contained on FAA Form 7460-6 Obstruction Evaluation Worksheet. It is assumed that the facilities at the PTC and I&T Complexes would be approximately 61 meters (200 feet) AGL and would require a Notice of Proposed Construction. In addition, based on the 100 to 1 slope criteria from the NASA Shuttle Landing Facility, facilities at the PTC Complex that exceed 47 meters (153 feet) and facilities at the I&T Complex that exceed 57 meters (187 feet) would require a Notice of Proposed Construction (figure 4.2.2-1).

A three-dimensional surface, based on FAA regulations, was generated for the NASA Shuttle Landing Facility. The proposed facilities at the PTC and I&T Complexes do not exceed the height of the Military Airport Imaginary Surface and therefore would not exceed the obstruction standards.

Operation of the LTF would not affect restricted airspace R-2934, located above the facilities.

4.2.2.2 Cumulative Impacts

No other activities that would impact airspace have been identified at the proposed LTF locations. The submittal of the required Notice of Proposed Construction, and adherence to any determinations made by the FAA, would preclude the potential for cumulative impacts to existing airspace users.

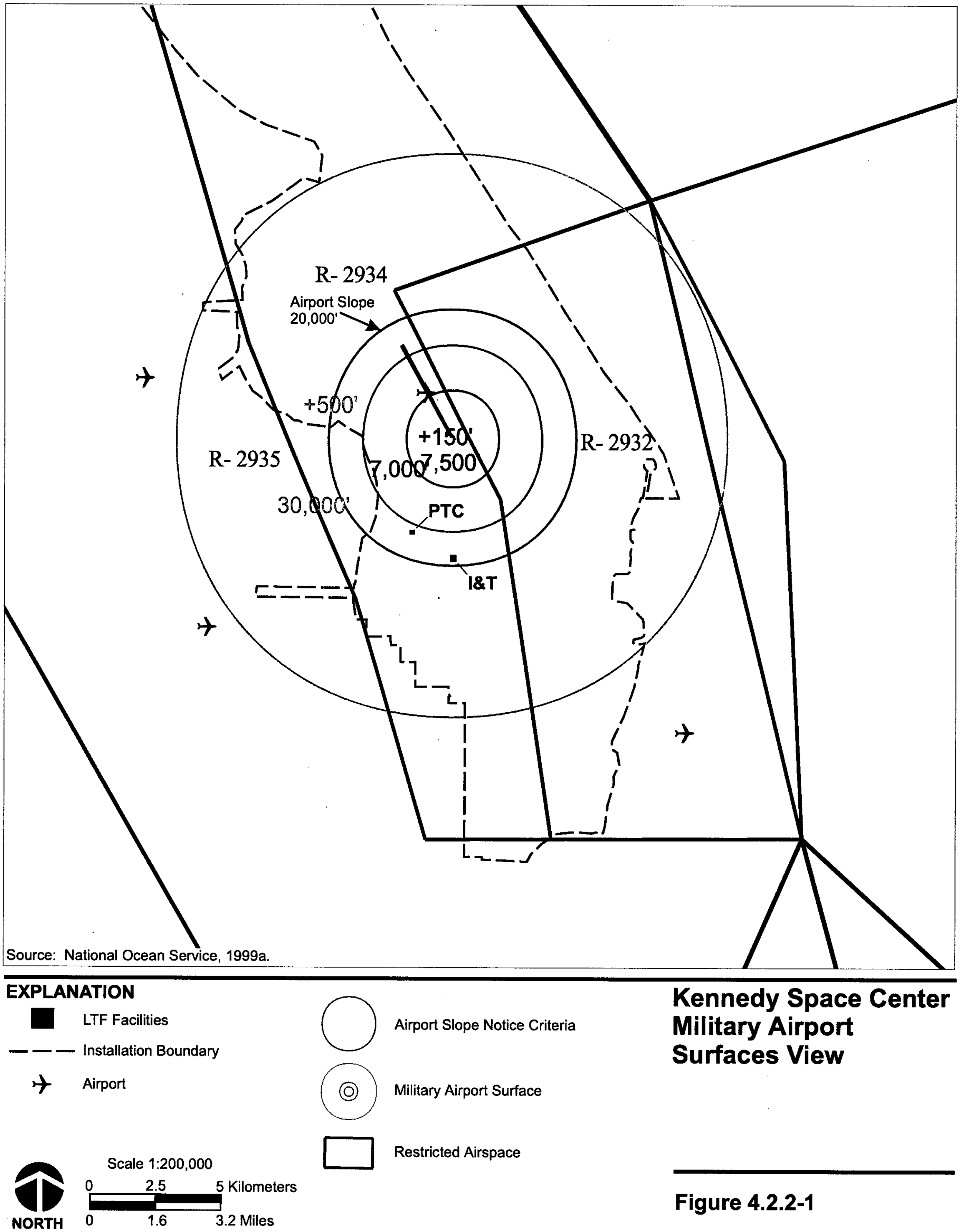
4.2.3 KSC BIOLOGICAL RESOURCES

4.2.3.1 Environmental Effects

The analytical approach for determining impacts to biological resources is discussed in the beginning of section 4.1.3. Based on this initial Section 7 consultation, additional study and analysis would be required if KSC is selected as the preferred alternative. The following sections discuss the environmental effects of the Proposed Action on biological resources found at KSC.

Construction

The proposed KSC alternative includes constructing the PTC within an area mainly occupied by disturbed shrubs and open water (see table 3.1.3-1), and the I&T Complex southeast of the PTC (figure 2-8). Vegetation is mainly scrub and slash pine and disturbed shrubs. Removal of vegetation at either location would not result in a substantial reduction in habitat available for wildlife in the area. No threatened or endangered plant species are expected to be affected by construction activities. No primary Florida scrub jay habitat is located within the area that would be cleared or



Kennedy Space Center Military Airport Surfaces View

Figure 4.2.2-1

as_ksc_01

disturbed by construction activities. Secondary Florida scrub jay habitat is located adjacent to the proposed location for the PTC. Any vegetation impacts associated with clearing areas that could potentially be used by Florida scrub jays would be in compliance with the KSC Scrub Habitat Compensation Plan currently in place at KSC.

Approximately 10 hectares (25 acres) of wetlands could potentially be disturbed by program activities. This area represents approximately 0.06 percent of the wetlands currently located on the installation. Construction activities after actual siting of the LTF would require application to the USACE for review of Federal dredge and fill permitting requirements (referred to as wetlands resource permitting by the Florida Department of Environmental Protection). Any loss of jurisdictional wetlands would be mitigated, as required by appropriate permits. Mitigation measures could include replacement, protection, or restoration of wetlands. The permitting process would entail review of proposed activities and possible mitigation measures by all applicable parties and agencies. The permitting process will be conducted in accordance with the U.S. EPA's guidelines for evaluating Section 404 permitting applications found in Section 404 (b)(1) of the Clean Water Act. Facility design would attempt to avoid direct and indirect disturbance of wetlands to the extent practicable. Mitigation measures would be developed during the permitting process once a site has been selected. Agency-recommended mitigations would take into account the size and quality of the wetlands involved. Mitigations for wetlands could include: (1) on-installation/base (if possible) replacement of any wetlands lost at a ratio determined through consultation with the USACE; (2) restoration/ enhancement of wetland habitat elsewhere on the base or purchase and fencing of any off-base replacement habitat; and (3) monitoring (until habitat becomes well established) of any replacement wetlands as required to determine the effectiveness of replacement and any remedial measures. Because the creation or development of wetlands represents a substantial financial investment, and the process may take several years to complete, this option is often reserved for wetland mitigation of high quality or for a sizable area of affected wetlands. The probability of success that a newly created wetland would survive and flourish could vary, which sometimes makes this option less desirable than wetland restoration or avoidance.

Avoiding disturbance to the wetlands could include controlling runoff from construction and operation sites into the wetland through use of berms, silt curtains, straw bales, and other appropriate techniques. Equipment should be washed in areas where wastewater can be contained and treated or evaporated.

Construction noise may disturb wildlife in the immediate vicinity during the construction period as described in section 4.1.3.1. Construction activities could disturb nesting, hatching, and fledging of land and shorebirds and other wildlife in the area. Roadside edges can represent optimal habitat for scrub jays, but they also have a high potential for mortality. The increase in traffic as a result of proposed construction is likely to increase the risk of Florida scrub jays and other wildlife being injured by vehicles. Restricting speed limits to 56 kilometers per hour (35 miles per hour) or less would reduce the potential for scrub jay mortality to exceed reproductive rates (Kennedy Space Center, 1997). Several bald eagle nests are located in the area, one approximately 1,067 meters (3,500 feet)

northeast of the proposed PTC site and an inactive nest approximately 914 meters (3,000 feet) northwest of the proposed I&T Complex site. Construction activities could cause eagles, or other listed bird species, that may be foraging in the area to temporarily avoid the area within approximately 15 meters (50 feet) of the site. Although the initial flushing would slightly increase the energy expenditure, additional foraging habitat occurs in the vicinity.

The USFWS has developed recommendations to minimize the effects of human activities on breeding bald eagles in Florida (U.S. Department of the Interior, 1987). A primary management zone is defined as occurring 229 to 457 meters (750 to 1,500 feet) from an active bald eagle nest. A secondary management zone is defined in Florida as extending a minimum of 457 meters (1,500 feet) from the boundary of the primary zone. The USFWS has identified restrictions on certain activities within these zones. Activities that should not occur within the primary zone at any time include residential, commercial, or industrial development; tree cutting or logging; construction and mining; and the use of chemicals toxic to wildlife. Activities that are restricted in the primary zone during breeding include unauthorized human entry and helicopter or aircraft operation within 152 meters (500 feet) vertical or 305 meters (1,000 feet) horizontal distance from the nest. Recommended restrictions within the secondary zone include the development of new commercial sites, multi-story buildings, and housing developments. In general no major activities should occur in this zone during the nesting period. Outside of the breeding season, activities such as logging, land clearing, drilling, and low-level aircraft operations may take place within the secondary zone. Relatively non-disturbing activities such as hiking, bird watching, fishing, and canoeing are permitted at all times in the secondary zone. (U.S. Department of the Interior, 1987)

The proposed construction sites are located outside the minimum Florida recommended management zone boundaries (686 meters [2,250 feet] for known eagle nests. Studies of impacts to wildlife on KSC have not identified any productivity limiting response to launch noises. Bald eagles using a nest adjacent to the Kennedy Parkway have received episodic noise exposures of 102 dB. Response to such high noise has been short-term with no apparent substantial effects. (National Aeronautics and Space Administration, 1995a)

No impacts to critical manatee habitat are anticipated as a result of construction activities. Consultation has been initiated with the USFWS concerning sensitive species and habitat.

Operation

As discussed in section 4.1.3.1, wildlife within a distance of approximately 0.6 kilometer (0.4 mile) could potentially be affected by noise from the performance tests. Impacts to biological species would be similar to those discussed in section 4.1.3.

Launch-related noise from Space Shuttle and Titan launches has not had a substantial effect on wildlife on or near the launch complexes (U.S. Department of Transportation,

1996). Overall, the level of noise impacts resulting from RD vehicle testing is expected to only have minimal effect on listed species for the following reasons:

- Shorebirds, eagles, and other raptors that regularly use habitats along the shores of KSC already experience loud noise from Shuttle and missile launches and may not react strongly to noise from this short-term test event.
- Human activity before the test would likely cause birds to leave the area before the test, reducing the number of individuals that would be exposed to the loudest noise levels.
- Only 16 tests per year are anticipated.
- The noise level would return to near ambient levels within 120 to 200 seconds.

The component of the exhaust stream that is of concern to biological resources is the hydrogen fluoride. Using the rated scrubbing rate and the maximum test duration, each test could result in the operational release of no more than 9.5 kilograms (21 pounds) of hydrogen fluoride along with the 57,000 liters (15,000 gallons) of water exhausted as superheated steam. Using the U.S. EPA-approved screening model, TSCREEN/PUFF, it was calculated that the maximum instantaneous concentration of hydrogen fluoride would be 6.27 milligrams per cubic meter (7.6 parts per million). As noted in section 4.1.1, this model uses conservative measures to obtain the highest possible concentrations. Actual concentrations are anticipated to be significantly lower than those predicted through modeling (due to variations in weather and the initial buoyancy of the exhaust cloud).

The hydrogen fluoride would be emitted as a gas and would remain a gas unless exposed to meteorological conditions of humidity greater than 90 percent and temperatures less than 50 degrees F. Under these more extreme circumstances the hydrogen fluoride could be converted into particles. However, even as a particulate, the hydrogen fluoride would still have a small size and would tend to act as PM-10 and due to its small size would tend to remain in the exhaust cloud. In either form the hydrogen fluoride would tend to be adsorbed into any water source with which it came in contact as the cloud dispersed. Under normal circumstances the cloud would be highly dispersed before coming into contact with the ground and as such deposition of hydrogen fluoride in any given area would be extremely low and would have minimal impact on surface water pH levels.

As an example, we assume the maximum instantaneous airborne concentration noted above (6.27 milligrams per cubic meter) is deposited on a 1-meter square area of water with a pH of 7 and an alkalinity of 25 milligrams per liter (calcium oxide equivalent). Further assuming the deposited hydrogen fluoride reacted with only the first 3 inches of water, the total volume of water in the reaction would be 75 liters (20 gallons). The total available alkalinity would be approximately 1,890 milligrams calcium oxide, only 3.15 milligrams of which would be required to neutralize the 6.27 milligrams of hydrogen fluoride deposited in this example. Therefore, there would be negligible loss of alkalinity. The overall pH of the system would also not be subject to change.

In systems with low mixing dynamics (slow current or no flow), it is possible that a thin acid layer would temporarily form over a more basic layer. If it occurred, this layering effect would be transitory and would be lessened by water flow or animal movements in the water.

Under rainy conditions, it is possible that the exhaust could be deposited in a smaller area, resulting in a greater amount of hydrogen fluoride in any given area. However, rain levels sufficient to wash the hydrogen fluoride from the exhaust cloud would also serve to dilute the acid and mitigate its impact on surface waters. Wind levels during such rain events would also serve to disperse the hydrogen fluoride even as the rain serves to concentrate it. The base pH of the rain would further serve to buffer any system to which the hydrogen fluoride is introduced. Rain has a pH range of approximately 4-8 under normal circumstances and the addition of the small amount of hydrogen fluoride would not be likely to cause a significant change in the pH of the rainfall. As such, hydrogen fluoride that is adsorbed into rain would not be likely to have a measurable impact.

No adverse impacts to manatees, bald eagles, or Florida scrub jays are expected as a result of emissions from operational testing of the RD vehicle.

Prescribed burning on KSC is required to maintain scrub jay habitat. According to the USFWS, the MINWR's fire management believes that scrub habitat maintenance may be affected by this program because of potential smoke management issues (U.S. Fish and Wildlife Service, 1999b). Because of current missions, MINWR's ability to conduct burns is presently hindered. The LTF program could potentially exacerbate this problem. Additional management activities such as water level management, exotic plant control, feral animal removal, and wildlife population surveys could also potentially be affected by the LTF program. Coordination with the applicable management authorities would be required to address these potential impacts. Further consultation with the USFWS and MINWR would be required after an alternative is selected and prior to any ground disturbance.

4.2.3.2 Cumulative Impacts

Cumulative impacts would be similar to those discussed in section 4.1.3.2.

4.2.4 KSC CULTURAL RESOURCES

4.2.4.1 Environmental Effects

Prehistoric and Historic Archaeological Resources

There are no National Register-listed or -eligible archaeological sites within either the direct ground disturbance areas for the LTF PTC Complex, the LTF I&T Complex, existing road upgrades, or the proposed 549-meter (1,800-foot) ESQD. One National Register-eligible site (site #8BR150) is located within the Laser Safety Zone, approximately 914 meters (3,000 feet) southeast of Building L5-683; however, the site is well away from the direct

ground disturbance proposed for the LTF facilities. However, because archaeological sites and artifacts are known to occur nearby (e.g., site #8BR150, which is in the Laser Safety Zone), there is some potential for cultural materials to be unexpectedly discovered during the course of project activities. In the event this should occur, all activities would halt in the immediate area and the Florida SHPO consulted through the KSC Environmental Office. Subsequent actions would follow guidance provided in 36 CFR 800.11 and/or in NAGPRA.

In addition, to ensure that site #8BR150 is not inadvertently damaged during LTF construction and operational activities, construction laydown areas will be placed, and vehicular and foot traffic will be routed, to avoid the site. Construction and operations personnel will be briefed regarding the sensitivity of archaeological resources and the types of penalties that can be incurred if sites are damaged or destroyed. Guidance for briefings and avoidance measures will be formulated in coordination with the KSC Environmental Office. As a result, no effects on historic properties are expected to occur.

Historic Buildings and Structures

Establishment of the LTF facilities at KSC will largely involve new construction; however, two existing buildings could be utilized—the Multi-Payload Processing Facility and the Payload Hazardous Servicing Facility. If utilized, these buildings are not expected to require modification.

The only buildings and structures within the ROI are buildings L5-683 and L5-734 (see description in section 3.1.6.2). Based on their ages, historic use, and architecture style, and on conversations with the KSC Cultural Resources Manager (Busacca, 1997), there is little likelihood that either building would be eligible for inclusion in the National Register; therefore, no effects on historic properties are expected. Consultation with the Florida SHPO regarding the LTF program in general will address this assessment.

Native Populations/Traditional Resources

There are no traditional cultural properties within the direct ground disturbance ROI for LTF activities; therefore, no effects are expected. Site #8BR150, which is located within the Laser Safety Zone, would likely be considered a traditional cultural property based on its site type (a prehistoric mound); however, it is well removed from the ground disturbance area, and no effects are expected (see section 4.1.4.3).

4.2.4.2 Cumulative Impacts

There are no past, present, or reasonably foreseeable future programs identified within the ROI for the LTF program; therefore, no cultural resources cumulative impacts would be expected to occur.

4.2.5 KSC GEOLOGY AND SOILS

Construction and operational impacts associated with the LTF project at KSC would be similar to those discussed for the Cape Canaveral AS alternative location (see section 4.1.5).

4.2.5.1 Environmental Effects

Construction

As previously mentioned, construction of the LTF at KSC would result in the disturbance of more than 2 hectares (5 acres) of land and, therefore, would be subject to NPDES construction permit requirements. Compliance with the NPDES SWPPP would minimize soil erosion and pollutant discharges during construction. In addition, compliance with the SPCC Plan would minimize the potential for accidental spills of hazardous chemicals to affect project soils. Construction activities would also require application to the USACE for review of Federal dredge and fill permitting requirements (referred to as wetlands resource permitting by FDEP). Approximately 6 hectares (15 acres) of wetlands would be disturbed during construction.

Operation

Soils in the area of LTF operations are generally slightly acidic to alkaline (average pH levels range from approximately 6.5 to 8.4) (Iowa State University Statistical Laboratory, 1998). Due to the natural buffering capacity of the soils, the deposition of small amounts of hydrogen fluoride would result in only minor and temporary decreases in soil pH. Because hydrogen fluoride deposition on soil surfaces would occur only during periods of high humidity and because hydrogen fluoride is highly soluble in water, small amounts of hydrogen fluoride residuals would be quickly diluted and buffered by rainfall. LTF operations are not expected to result in long-term changes in the chemical composition or physical characteristics of soils located within the project's ROI.

In addition, compliance with the NPDES SWPPP would minimize soil erosion and pollutant discharges during project operations. Compliance with the SPCC Plan would minimize the potential for accidental spills of hazardous chemicals to affect project soils. Operational activities are not expected to result in long-term changes in the chemical composition or physical characteristics of soils located within the project's ROI.

Because KSC is located in a low seismic risk area, the potential occurrence of liquefaction, seismic settlement, or ground rupture at the project sites is considered minimal. In addition, soils at the LTF site exhibit low shrink/swell susceptibility. Potential geotechnical problems associated with the construction of the LTF at KSC are considered minor.

4.2.5.2 Cumulative Impacts

Temporary, minor impacts to geology and soils, when combined with other current and foreseeable future activities, would not result in cumulative impacts.

4.2.6 KSC HAZARDOUS MATERIALS AND HAZARDOUS WASTE MANAGEMENT

For a discussion and description of the hazardous materials and hazardous wastes associated with LTF, see Cape Canaveral AS section 4.1.6.

4.2.6.1 Environmental Effects

Construction of the LTF would generate hazardous materials such as motor fuels, waste oils, paints, and solvents. These materials would be containerized and properly disposed of by the individual contractor. In addition, construction of the LTF facilities would require the demolition of one existing structure. Demolition of structures with ACM has a potential for releasing asbestos fibers into the air. Asbestos fibers could be released due to disturbance or damage of various building materials such as pipe and boiler insulation, acoustical ceilings, sprayed-on fireproofing, and other material used for soundproofing or insulation. Testing for ACM is necessary if the absence of asbestos cannot be verified. Similarly, suspected lead-based paints and PCBs encountered during any demolition would require testing and special handling. Paints that exceed the limits for lead must be removed in accordance with the applicable health and safety standards and disposed of as hazardous waste. PCB-contaminated equipment must be either retrofilled with non-PCB dielectric fluid and the PCB-contaminated fluid disposed of as PCB waste, or the entire piece of equipment must be disposed of as PCB waste. Depending on the concentrations, typical PCB waste disposal may be by incineration or landfilling in a specially permitted facility.

The operation and maintenance of an LTF at KSC would increase the amounts of hazardous materials used and hazardous wastes generated at KSC. These hazardous materials and hazardous wastes listed in table 2-6 include paints, solvents, acids, bases, ethylene glycol, and alcohol, as well as hydrogen fluoride- and sodium fluoride-contaminated wastes. The hazardous materials are similar in type but not in quantity to those currently being used at KSC. RCRA requires that as a generator of hazardous wastes, the LTF facility would be required to acquire a U.S. EPA ID number. All waste generated by the LTF would be stored, transported, and disposed of under this number. Any waste stored onsite more that 90 days would require a RCRA permit. Procedures, personnel, and facilities are in place to manage the additional hazardous materials and wastes. Pollution prevention efforts as defined by the NASA/KSC Environmental Program Office would apply to LTF activities.

4.2.6.2 Cumulative Impacts

The additional quantities of hazardous materials or hazardous wastes would be less than 1 percent of the total hazardous waste generated by KSC. This increase, when combined with expected future programs, would not exceed existing permits or programs. Therefore, cumulative impacts relative to hazardous materials or hazardous wastes are not expected.

4.2.7 KSC HEALTH AND SAFETY

4.2.7.1 Environmental Effects

Construction

Few existing structures would be used at KSC. The presence or absence of asbestos must be determined before existing structures are demolished. Preparation for new construction includes road improvements to accommodate LTF traffic, clearance of existing vegetation, grading, and excavation for foundations. An area would be prepared for construction equipment laydown, personal vehicle parking, temporary mobile offices (trailers), maintenance facilities, and other construction needs. Excavation for foundations and footings present hazards from loose, unconsolidated soils and high water tables. Concrete for foundations and footings and other construction materials would be delivered by truck in accordance with DOT and NASA regulations. Construction activities would be conducted in accordance with OSHA, NASA, and USACE requirements for health and safety to control exposure to occupational safety and health hazards.

Operations—General Considerations

See section 4.1.7.1 for a general description of health and safety effects of LTF operations.

Operations—KSC

For the sites under consideration at KSC, the safety zones, including the 6-hectare (15-acre) PTC Complex, the 550-meter (1,800-foot) inhabited building ESQD, and the 1.2-kilometer (0.75 mile) Laser Safety Zone would impact no other structures or areas designated for other activities and would impact the USFWS management of the National Wildlife Refuge, as discussed in section 4.2.8.1.

The dispersion of the exhaust emission from the PRS would be modeled for meteorological conditions before each test. When modeling indicates the concentration of hydrogen fluoride would exceed the exposure criterion of 3 ppm at the boundary of the exclusion zone, the test would be delayed until more favorable meteorological conditions prevail.

Facility and equipment designs would incorporate measures to minimize the potential for and impact of accidental releases. Operating procedures and training would be instituted to minimize the potential for and impact of releases of hazardous materials. Appropriate emergency response plans would be established and implemented to deal with potential chemical releases.

4.2.7.2 Cumulative Impacts

All work on the Proposed Action would be performed in accordance with applicable health and safety regulations. No injuries or illnesses are anticipated. No other activities have been identified within the ROI that when combined with the Proposed Action would have a cumulative impact on health and safety.

4.2.8 KSC LAND USE AND AESTHETICS

4.2.8.1 Environmental Effects

Regional Land Use

The proposed project would be located in the western central portion of KSC. The PTC Complex would be surrounded by Oyster Prong on one side, which is a tributary of Moore Creek, and the rest of the base on the other sides. The I&T Complex would be located north of the Visitor Complex off of Roberts Road and to the southeast of the PTC Complex. Therefore, construction and operational activities would not affect adjacent off-base land uses. No noise-related impacts on adjacent land use are anticipated because noise should be below background noise levels at the 1.2-kilometer (0.75-mile) Laser Safety Zone radius. See the Chapter 4 sections on noise for additional noise information.

On-base Land Use

The construction and operation of new facilities would primarily be concentrated to the area immediately around the PTC and I&T Complexes. The PTC Complex would require approximately 6 hectares (15 acres) and the I&T Complex approximately 10 hectares (25 acres). Up to 20 hectares (50 acres) could be disturbed during the construction phase, which includes a 4-hectare (10 acre) construction laydown area south of the PTC Complex. The proposed PTC Complex and I&T Complex would be located in the General Support Zone, which consists of administrative, logistical and industrial support facilities. The PTC Complex, I&T Complex, and site operations (including the inhabited building ESQD and Laser Safety Zone) may require specific planning zones, such as a hazardous operations zone, within the general support zone to allow for hazardous operations. This would be similar to the specific site planning zones established for the Industrial Area and the VAB Area.

The PTC and I&T Complex locations are also part of the MINWR, and prior to construction approximately 16 hectares (40 acres) would be removed from the MINWR and transferred to KSC. The establishment of the LTF and laser safety zone in the proposed location would impact the management of the MINWR. Access to the habitats within the area to accomplish water level measurement, exotic plant control, feral animal removal, and surveys of wildlife populations would be limited. As described in section 4.2.3, Biological Resources, the ability to conduct prescribed burning in support of the Florida scrub jay would also be limited. Coordination between the MINWR and the LTF management would help to lessen the impact; however, the USFWS believes additional studies would be required (U.S. Fish and Wildlife Service, 1999b).

There are two small buildings located at the potential PTC Complex site off of Schwartz Road West. One of the buildings is vacant and the other is used to house stray cats caught on base. Both facilities would be removed. The proposed facilities and operations would not result in the conversion of prime agricultural land.

Coastal Zone Management

The proposed PTC and I&T Complexes do not lie within the FCMA no development zone; therefore, construction of the LTF at either location would be consistent with the FCMA. However, both sites lie within the coastal zone and are subject to a Federal coastal zone consistency determination, which is administered by the FDCA. The proposed LTF's effects on the coastal zone have been evaluated based on the Florida Coastal Management Program enforceable policies, statutes, and regulations and determined to be consistent to the maximum extent practicable at either location (Florida Department of Community Affairs, 1997). If KSC is selected, NASA would prepare a Coastal Zone Consistency Determination for the LTF and support facilities and submit it to the FDCA for review.

Aesthetics

New construction would result in a moderate alteration of the views of KSC. Several of the proposed facilities would be approximately 61 meters (200 feet) tall, which is not out of character with the existing VAB or Launch Pads that are up to 160 meters (525 feet) tall. Even though these facilities would be new and of a different style, they would only moderately change the character of the views of the area. Views of the site are primarily limited to marine traffic to the east (5.8 kilometers [3.6 miles] and west (1.9 kilometers [1.2 miles], to Cape Canaveral, Port Canaveral, and Cocoa Beach to the south (over 6.4 kilometers [4 miles], Titusville to the west (9 kilometers [5.6 miles], and other distant offsite beach areas. Therefore, construction and operation of the proposed LTF would have a moderate effect on the area's aesthetic quality. The LTF would briefly limit the view of a shuttle launch along a very narrow corridor west of the LTF.

4.2.8.2 Cumulative Impacts

In terms of potential for cumulative impacts, the development of KSC has changed less than 5 percent of the natural undeveloped nature of the land. The proposed site for the PTC and I&T Complexes are currently dominated by a vegetative state and have been in the past except for the two small buildings at the proposed PTC location. The conversion of this land at either location for the proposed PTC and I&T Complexes would change the characteristics of the western portion of KSC and remove approximately 16 hectares (40 acres) from MINWR, but would affect less than 1 percent of the land at KSC. No other programs have been identified that in conjunction with the LTF program would contribute to cumulative land use impacts.

4.2.9 KSC NOISE

4.2.9.1 Environmental Effects

A general discussion of noise is given in section 4.1.9. Potential impacts from LTF program activities could come from noise generated by construction equipment during construction activities and from noise generated by the PRS during operational activities.

Construction

At a distance of approximately 15 meters (50 feet) the noise from typical construction equipment falls in the range of 70 dBA to 100 dBA (with peak noise from pile drivers going as high as 110 dBA) (U.S. Environmental Protection Agency, 1971). As such, under most meteorological conditions, all construction noise would be anticipated to attenuate to 85 dBA at a radius of approximately 270 meters (890 feet) from the construction site. As no point on the KSC facility boundary is anticipated to be closer than this, then no noise impacts to the public from construction noise would be anticipated.

Operation

While it is operating, the PRS is anticipated to generate a noise level of approximately 125 dB at a distance of 15 meters (50 feet) from the end of the PRS ejectors. Assuming no attenuation due to intervening structures or vegetation, the noise from such a source would attenuate to approximately 85 dB at a radius of approximately 1.0 kilometer (0.64 miles). As this would be within the 1.2-kilometer (0.75-mile) Laser Safety Zone, no impacts to the noise environment would be anticipated from the operation of the PRS. This is especially true because operation of the PRS would be only a few minutes duration approximately 16 times per year.

The PRS would be built such that the ends of the ejectors are not aligned in the direction of known noise sensitive receptors. Noise barriers, such as walls or groups of trees, could be placed between the ends of the PRS ejectors and noise sensitive receptors to further reduce the potential for impacts.

4.2.9.2 Cumulative Impacts

Noise impacts for KSC would include those from current programs and those expected from LTF activities. Most of these noises are intermittent and are not expected to cumulatively impact the area.

4.2.10 KSC SOCIOECONOMICS

The ROI of the Proposed Action for KSC would be identical to that of Cape Canaveral. While the Proposed Action, and its impacts and mitigations, would also be similar to Cape Canaveral the construction impacts would vary slightly due to differing construction costs. The KSC alternative is estimated to require $102.26 million of construction work. This would lead to the creation of 1,273 full-time equivalent construction jobs and $31.4 million in total wage income. The expenditure impacts would include $25.45 million of personal consumption expenditure and $42.95 million spent on construction materials of various types.

The environmental effects of construction and operation of the LTF at KSC would be similar to the effects described in section 4.1.10.1 for Cape Canaveral AS.

4.2.11 KSC TRANSPORTATION

4.2.11.1 Environmental Effects

Roadways

During the LTF construction phase, total anticipated vehicle trips per day would be as follows: 800 vehicle trips per day and 10 truck trips per day, with a peak of 50 truck trips per day. Operations traffic would generate approximately 240 vehicle trips per day and 1 truck trip per day.

The proposed LTF site is far removed from current operational areas (Kennedy Space Center, 1998b) and traffic levels are accordingly low. However, in order to provide access to the proposed I&T site near Roberts Road and the PTC Complex on Schwartz Road West, some development (road improvements) would be required (Kennedy Space Center, 1998b); Schwartz Road West and Roberts Road would require considerable upgrading to accommodate construction and operations traffic. Construction would generally be contained within previously disturbed areas and would be conducted in accordance with a construction SWPPP and SPCC Plan that would be developed for this project. Although ADT numbers are not available for Schultz Road West and Roberts Road, LTF project demands would increase ADT by approximately 95 percent. The upgraded roads would accommodate the traffic; however, the increase would have an impact on current users.

The primary road potentially affected by LTF activities is Kennedy Parkway South. The ADT for the segment of Kennedy Parkway 4.8 kilometers (3 miles) north of SR-528 is 7,900 northbound and 7,800 southbound. LTF project demands would average to a 10.2-percent increase over current levels. The nearest offsite roadway accessing the project area is NASA Parkway West, whose 1996 annual ADT levels amounted to 9,500 eastbound and 12,500 westbound. Construction project demands would amount to an increase of approximately 4.3 percent and 3.2 percent, respectively.

Transportation of hazardous materials would be accomplished in accordance with DOT regulations for interstate shipment of hazardous substances.

Waterways

The proposed LTF sites are located at a remote site near Schwartz Road West and adjacent to the Indian River/Intracoastal Waterway. The distance from the proposed LTF sites to the VAB Barge Terminal Facility is approximately 8.9 kilometers (5.5 miles). Barge transport of the RD vehicle at the conclusion of the test program could be accommodated using existing facilities with minimal impact.

Access to, and facilities at, Port Canaveral could also be utilized to meet the minimal potential shipping requirement at KSC.

Railways

The distance from the proposed LTF site to the nearest railroad spur at the Contractor's Road yard is 5.8 kilometers (3.6 miles). The railway would be used approximately three times per year for shipping and receiving LTF-related components, resulting in minimal impacts.

Airways

The Shuttle Landing Facility, located approximately 12.1 kilometers (7.5 miles) from the project site, as well as the Cape Canaveral AS Skid Strip, has more than adequate capacity to handle potential shipping and receiving of LTF-related components approximately three times per year.

4.2.11.2 Cumulative Impacts

No transportation impacts are expected outside of KSC boundaries. Roadways used to travel to and from proposed LTF sites have sufficient carrying capacity or would be upgraded to handle the increase in traffic. Cumulative impacts are expected to be non-existent or minimal, with no anticipated degradation of transportation quality or increase in travel time. No other programs have been identified that, when combined with LTF-related transportation impacts, would contribute to cumulative impacts to transportation.

4.2.12 KSC UTILITIES

4.2.12.1 Environmental Effects

Water Supply

Water requirements during the LTF construction period, for general activities and dust control, are listed in table 2-3. The daily LTF requirement would be 0.5 percent of the current KSC average daily use. Combining Cape Canaveral AS usage and LTF usage would result in a total usage of 32 percent of the available water supply.

LTF water demands during operation (listed in table 2-4) would be 0.5 percent of current use and when combined with current KSC usage would result in a total usage of 32 percent of the available water supply.

LTF-related annual water usage would not overload the KSC capacity. Current sources of water are sufficient to meet demands of the proposed project.

Wastewater

During construction for the LTF, a temporary concrete batch plant would be erected at the site, and water from the plant would be captured and collected in a retainment or

detainment pond (depending upon the requirements of the site). Wastewater would be treated and disposed of in accordance with existing permit limitations.

The proposed LTF site would require a connection to the 15-centimeter (6-inch) force main of the Industrial Area WWTP, as well as a package dual grinder pump station with 246-liter (65-gallon) per day pumps. The current NPDES permit has sufficient capacity to absorb LTF requirements.

Estimated levels of wastewater produced during LTF construction activities are listed in table 2-3. Assuming 250 working days per year, KSC total WWTP design capacity would be 738 million liters (195 million gallons) annually. Annual LTF wastewater demands during construction would be 0.02 percent of the total capacity.

Monthly wastewater requirements for LTF operations are listed in table 2-4. Assuming 20 working days per month, LTF requirements would be 0.46 percent of the current total capacity.

Solid Waste

Additional demands on KSC solid waste disposal resulting from proposed project demands and personnel increases would be negligible.

The KSC landfill is expected to handle the solid waste disposal needs for an estimated 13 to 49 years, based on assumed disposal rate scenarios of 318 metric tons (350 tons) per week (13 years) and 82 metric tons (90 tons) per week (49 years) (Kennedy Space Center Environmental Program Office, 1997). The Brevard County Landfill is also available.

Various types of solid waste/construction debris would be generated during construction. Estimated total waste for LTF-related work is 91 to 136 metric tons (100 to 150 tons) per month during peak construction activity. The total waste is estimated to be 1,361 metric tons (1,500 tons) over the course of the construction.

Where practicable, solid waste would be recycled. Removal of construction debris will be handled by the construction contractor; unused cut and fill material would be transported from the project area to an approved spoil site.

LTF monthly solid waste demands during operation are listed in table 2-4 and would be 54 percent of current demand. This would result in a total usage of 0.28 percent of the Central Disposal Facility's available capacity.

Energy

Additional demands on the KSC electrical systems by the Proposed Action would be insufficient to cause detrimental infrastructure impacts, and would thus be negligible.

Florida Power and Light supplies KSC with approximately 150 million kWh annually. Most onsite utility structures are operating at or near design capacity and lifespan. (U.S. Department of the Air Force and National Aeronautics and Space Administration, 1993)

Based on monthly requirements, LTF electricity demands during operation would total approximately 2 percent of the current demand, and assuming 250 working days per year, would result in a total usage of less than 0.3 percent of available capacity.

The proposed LTF site has capacity to meet LTF requirements of 1,000 therms per month, but requires a connection to the 30.5-centimeter (12-inch) natural gas line at Kennedy Parkway and East Avenue.

LTF natural gas demands during operation would amount to a 0.3 percent increase over current demand, well within system capacity (Thalasinos, 1999).

4.2.12.2 Cumulative Impacts

Proposed project activities should have minimal to no impacts outside of KSC facilities and, therefore, no cumulative impacts are anticipated. The increase in personnel is not expected to appreciably impact the facilities of Brevard County or surrounding communities, such as Cocoa and Cocoa Beach. No other programs have been identified that, when combined with LTF-related requirements, would contribute to cumulative impacts.

4.2.13 KSC WATER RESOURCES

Construction and operational impacts associated with the LTF project at KSC would be similar to those discussed for the Cape Canaveral AS alternative location (see section 4.1.13).

4.2.13.1 Environmental Effects

Construction

Construction of the LTF at KSC would result in the disturbance of more than 2 hectares (5 acres) of land and, therefore, would be subject to NPDES construction permit requirements. Compliance with the NPDES SWPPP and State of Florida storm water management requirements would minimize soil erosion and pollutant discharges during construction. In addition, compliance with the SPCC Plan would minimize the potential for accidental spills of hazardous chemicals to affect surface and groundwater resources. Construction activities would also require application to the USACE for review of Federal dredge and fill permitting requirements (referred to as wetlands resource permitting by FDEP).

Construction-related earthwork would follow guidelines of the appropriate SWPPP. It is anticipated that existing permits will cover construction activities. Storm water will

necessitate a retention pond, with water treatment carried out per applicable local regulations. Any onsite demolition will require additional consideration to account for the possibility of special treatment requirements for existing materials, such as lead-based paint or asbestos.

Operation

Due to the natural buffering capacity of nearby surface waters, the deposition of small amounts of hydrogen fluoride are anticipated to result in only slight and temporary decreases in water pH. Small amounts of hydrogen fluoride deposited on water surfaces would quickly dissipate due to surface water mixing and the natural buffering capacity of the nearby surface waters.

The risk of accidental releases of hazardous materials or wastes is considered minimal. All activities conducted on the project site would be required to comply with the SPCC Plan, to be developed and implemented as part of this project. Compliance with the SPCC Plan would minimize the potential for accidental spills of hazardous chemicals to affect surface and groundwater resources.

Operations at KSC, including the proposed LTF site, would be required to comply with NPDES industrial permit requirements. Discharges of treated wastewaters are regulated by the St. Johns River Water Management District for compliance with Federal and State of Florida water quality standards. Any change in design, construction, operation, or maintenance of facilities that result in an increase of pollutant discharge to State waters, would require application for a NPDES permit (or amendment of an existing applicable permit) and potential revisions to the SWPPP. Existing facilities at KSC have individual point source permits; however, KSC is currently seeking to unify all facilities under a single "multi-sector" permit (EDAW, Inc., 1998a). The Proposed Action would require application for an individual NPDES permit, or, if approved, amendment of the unified NPDES permit for inclusion of wastewater discharges associated with the operation of the proposed facilities. Compliance with the NPDES and State of Florida storm water management requirements would minimize pollutant discharges during project operations.

Areas proposed for LTF activities are located within a 100-year floodplain (National Aeronautics and Space Administration, 1992). EO 11988 directs Federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with occupancy and modification of floodplains. Because average surface elevations are low (approximately 3 meters [10 feet] above msl), the proposed LTF sites would be subject to severe flooding from storm surge tides. Potential impacts to the LTF from storm surge tides would be considered in the design. Although construction and operation of the proposed facilities would occur within a designated 100-year floodplain, and the area would be subject to storm surge tides, the LTF would not noticeably increase the potential for floods and no adverse impacts to water quality or quantity are expected.

4.2.13.2 Cumulative Impacts

No other activities that would impact water resources have been identified at the proposed LTF locations. No future programs have been identified that when combined with the Proposed Action would contribute to cumulative water resources impacts.

4.2.14 KSC ENVIRONMENTAL JUSTICE

4.2.14.1 Environmental Effects

EO 12898 requires that Federal agencies identify and address disproportionately high and adverse environmental effects (including human, health, and economic and social effects) of its programs, policies, and activities on minority and low-income populations. An environmental justice impact would be a long-term health, environmental, cultural, or economic effect that has a disproportionately high and adverse effect on a nearby minority or low-income population, rather than all nearby residents. The potential for a disproportionately high and adverse effect could occur under either of two conditions: (1) the percentage of persons in low-income or minority populations in the census tracts exceeds the percentage in the county, the region of comparison, or (2) the percentage of low-income or minority population in the census area exceeds 50 percent.

Construction and operation of the LTF at KSC would not disproportionately affect any minority or low-income populations. The potential environmental or human health impacts noted above would be contained within the KSC boundary and would not impact any populated areas. No Native American or traditional cultural resources would be impacted from LTF construction and operation.

4.2.14.2 Cumulative Impacts

No other projects or activities in the region along with LTF have been identified that would contribute to potential cumulative environmental justice impacts.

4.3 REDSTONE ARSENAL

4.3.1 RSA AIR QUALITY

4.3.1.1 Environmental Effects

Potential impacts to air quality at RSA are similar to those described in section 4.1.1 for Cape Canaveral AS.

Construction

Construction activities would disturb up to approximately 20 hectares (50 acres) for a period of up to 30 months. Table 4.3.1-1 presents the estimate of potential construction emissions due to the proposed construction at RSA using the procedure and assumptions outlined in section 4.1.1.

Table 4.3.1-1: Potential Construction-related Emissions at Redstone Arsenal

Pollutant	Year One[1] – Metric Tons (Tons)	Year Two – Metric Tons (Tons)	Year Three[2] – Metric Tons (Tons)
Carbon Monoxide	7.02 (7.74)	14.04 (15.48)	7.02 (7.74)
Oxides of Nitrogen	9.47 (10.44)	18.95 (20.89)	9.47 (10.44)
Oxides of Sulfur	0.50 (0.55)	1.01 (1.11)	0.50 (0.55)
PM-10	134.24 (147.98)	1.90 (2.10)	0.95 (1.05)
Reactive Organic Gases[3]	3.15 (3.47)	6.30 (6.94)	3.15 (3.47)

Source: Derived from Sacramento Metropolitan Air Quality Management District, 1997.

[1]Emissions estimate includes all fugitive dust emissions due to grading.

[2]Emissions during year three are limited to six months of construction.

[3]Reactive Organic Gases are similar to VOCs, but include additional gases. It is used here as a conservative estimate of VOC emissions.

PM-10 = particulate matter with a mean aerodynamic diameter of a nominal 10 micrometers

Specific facility design has not progressed to the point where it is practical to predict maximum construction-related ambient levels of PM-10 or exhaust products. However, construction of the LTF would be carried out using standard construction methods, including normal dust suppression measures, appropriate for this size construction project. As such, while construction activities would be expected to cause increases in air pollutants, it is anticipated that these emissions would not cause exceedances of the NAAQS or state AAQS beyond the bounds of the construction area. In addition, construction activity levels in the area would be managed so as to maintain compliance with OSHA workplace health standards.

Dust suppression methods could include periodic watering of exposed soils, chemical stabilization of inactive areas, and wind breaks to reduce wind speed and consequent entrainment of dust. Proper tuning and preventative maintenance of construction vehicles would serve to minimize exhaust emissions and maximize vehicle performance. (U.S. Environmental Protection Agency, 1999c)

Operation

Assuming all project-related traffic is new traffic and it all utilizes Buxton Road, the proposed action would be expected to result in less than a 15 percent increase over current levels during construction and less than a 5 percent increase during operations as noted in section 4.3.11. It is reasonable to assume the level of traffic increase that would be caused by the proposed action would not cause detrimental impacts to the area's air quality.

All stationary emissions sources would be incorporated in the RSA Title V Air Permit. Emissions due to daily operations would be limited to maintenance-related emissions (including setup for non-laser testing, site maintenance, and periodic operation of the backup generators). It is possible the installation of the backup power sources, PRS, and PRS boilers could require a re-negotiation of the site Title V Air Permit. If this were determined to be the case, it could take a year or more to finalize the permit.

Potential emissions due to the operation of the proposed backup power sources are summarized in table 4.1.1-2.

Each laser test would result in the operational release of less than approximately 9.5 kilograms (21 pounds) of hydrogen fluoride. As indicated in section 4.1.1, these releases would not be expected to cause exceedances of health safety levels beyond the Laser Safety Zone, which would be evacuated before operation of the PTC. As such, it is anticipated that there would be no impact to air quality due to the proposed laser testing.

Laser testing would require the operation of the PRS boilers. It is expected that combustion of approximately 13,250 liters (3,500 gallons) of diesel fuel would be required for each test in order to heat the PRS boilers. Table 4.1.1-3 provides a summary of the projected boiler emissions. Construction permits may be required prior to installation of the boilers, but no additional PSD analyses are anticipated.

Installation of air pollution control technology would reduce the amount of pollutants emitted by the PRS boilers. Specific emission reductions would depend upon which control technologies were available and applicable.

Table 4.3.1-2 compares the current emissions at RSA with the anticipated emissions due to the proposed operation of the PTC and I&T Complexes.

Table 4.3.1-2: Comparison of Current and Proposed Annual Emissions at Redstone Arsenal

Pollutant	Annual Emissions in Metric Tons (Tons)		
	Current Emissions[1]	LTF-related Operations Emissions[2]	Total Projected Annual Emissions
Carbon Monoxide	9.83 (10.84)	3.89 (4.29)	13.73 (15.13)
Oxides of Nitrogen	43.32 (47.75)	16.93 (18.22)	59.85 (65.97)
Oxides of Sulfur	49.11 (54.14)	9.18 (10.12)	58.30 (64.26)
PM-10	95.26 (105.01)	0.29 (0.33)	95.56 (105.34)
Volatile Organic Compounds	357.18 (393.72)	0.48 (0.53)	357.66 (394.25)
Hazardous Air Pollutants	20.62 (22.73)	<0.01 (<0.01)	20.62 (22.73)

[1]Source: U.S. Army Environmental Center, 1994.

[2]Includes backup generator emissions (table 4.1.1-2) and PRS boiler emissions (table 4.1.1-3)

PM-10 = particulate matter with a mean aerodynamic diameter of a nominal 10 micrometers

Mishap Impacts

Potential mishaps and their potential impacts at RSA are similar to those described in section 4.1.1.1. The most likely accidental release would occur during fuel transfer and would be limited to a few ounces of reactant. Due to the greater potential for hazardous releases during refueling, it would only be conducted under meteorological conditions that would not result in hazardous conditions beyond the laser safety zone if a release were to occur. The least likely mishap is one involving the majority of either fluorine or nitrogen trifluoride. If this level of accidental release were to occur under proper weather conditions, it could result in hazardous conditions beyond the laser safety zone (appendix D). The facility Hazardous Management Plan would include the proper responses to accidental releases in order to minimize its impact to the populace and the environment.

4.3.1.2 Cumulative Impacts

No other concurrent construction projects have been identified. However, PM-10 and vehicle exhaust emissions generated during construction would add cumulatively to the impacts from other dust sources in the immediate vicinity of the construction site. Impacts due to elevated dust levels would be expected to be localized and intermittent, dependent on construction activities, activity level, and prevailing weather conditions. No exceedance of the NAAQS, state AAQS, or health-based standards of non-criteria pollutants would be anticipated due to proposed construction activities.

Daily operations would add to the area's ambient pollution levels. Stationary sources, including the proposed generators and PRS boiler, would be incorporated into the RSA Title V Air Permit. No PSD analysis requirement is anticipated.

Mobile emissions associated with personnel traveling to and from the sites and associated with operational vehicles would add incrementally to the current level of mobile emissions

in the area. However, the addition of up to 250 vehicle trips per day would not be expected to have a noticeable cumulative impact on air quality.

The operational emission of hydrogen fluoride during laser testing would be incorporated into the site's Title V Air Permit and would be expected to have only a negligible cumulative impact in conjunction with other hazardous air pollutant emissions at RSA.

4.3.2 RSA AIRSPACE

4.3.2.1 Environmental Effects

This section summarizes the results of applying the obstruction standards contained on FAA Form 7460-6 Obstruction Evaluation Worksheet. It is assumed that the facilities at the PTC and I&T Complexes would be approximately 61 meters (200 feet) AGL and would require a Notice of Proposed Construction. The proposed PTC Complex and I&T Complex are not within 6.1 kilometers (3.8 miles) of the Redstone Army Airfield or the Huntsville International Airport and therefore do not meet the slope from airport notice criteria (figure 4.3.2-1).

A three-dimensional surface, based on FAA regulations, was generated for the Redstone Army Airfield. The proposed facilities at the PTC and I&T Complexes do not exceed the height of the Military Airport Imaginary Surface and therefore would not exceed the obstruction standards. The proposed facilities do not exceed any of the other obstruction standards or airport imaginary surfaces standards.

Operation of the LTF would not affect restricted airspace R-2104A, located above the LTF facilities.

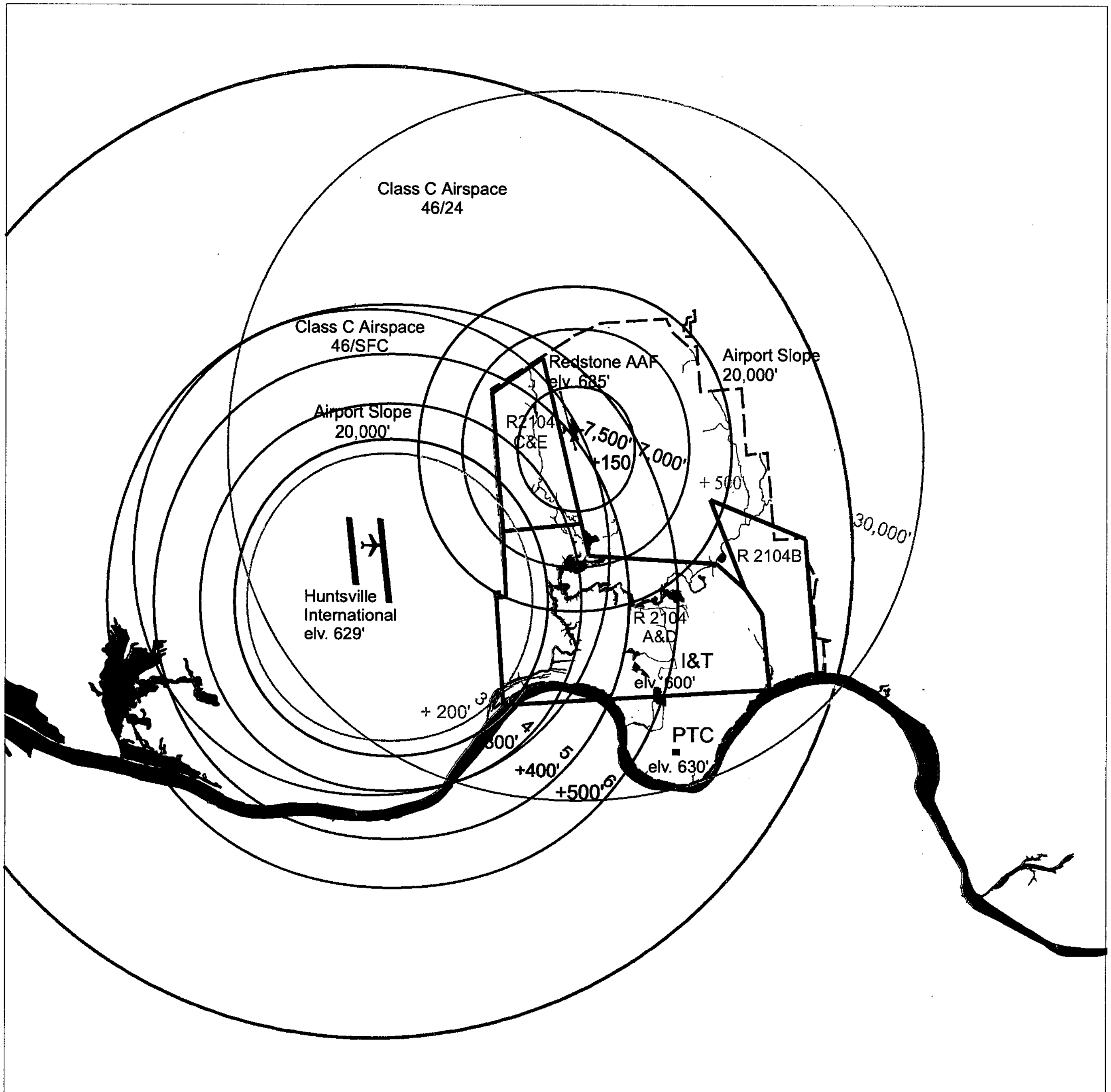
4.3.2.2 Cumulative Impacts

No other activities that would impact airspace have been identified at the proposed LTF locations. The submittal of the required Notice of Proposed Construction, and adherence to any determinations made by the FAA, would preclude the potential for cumulative impacts to existing airspace users.

4.3.3 RSA BIOLOGICAL RESOURCES

4.3.3.1 Environmental Effects

The analytical approach for determining effects to biological resources is described in the beginning of section 4.1.3. The following sections discuss the environmental effects of the Proposed Action on biological resources found at RSA.



Source: National Ocean Service, 1999b.

EXPLANATION

3,4,5,6 Airport Obstruction Standards

LTF Facilities

Installation Boundary

Water

Airport

Scale 1:200,000

0 2.5 5 Kilometers

0 1.6 3.2 Miles

NORTH

Airport Slope Notice Criteria

Class C Airspace

Military Airport Surface

Restricted Airspace

Redstone Arsenal Military Airport Surfaces View

Figure 4.3.2-1

as_rsa_01

Construction

The proposed RSA alternative includes construction of the PTC Complex in the southern portion of RSA within a pine-forested area currently holding earthen-covered concrete storage bunkers. The areas immediately surrounding the bunkers are maintained by mowing. The I&T Complex would be located in the vicinity of Building 8027 in an area mostly maintained by mowing, as shown in figure 2-10.

Although removal of vegetation could displace wildlife, it would not result in a substantial reduction in habitat available for wildlife in the area. No threatened or endangered plant species have been identified as occurring within or adjacent to the project areas.

Construction noise caused by truck traffic to and from the construction site and the use of heavy machinery and excavation equipment may disturb wildlife in the immediate vicinity during the construction period. Construction activities could disturb nesting, hatching, and fledging of land and shorebirds and other wildlife in the area; however, this would be a short-term effect as described in section 4.1.3. No listed bird species have been identified as nesting on RSA. The likelihood that transient bald eagles would be adversely impacted is anticipated to be slight.

No impacts to wetlands are expected. Best Management Practices such as filtering sediment from storm water runoff would be implemented.

Operation

A discussion of effects of noise on wildlife is provided in section 4.1.3.1. Overall, the level of noise impacts resulting from RD vehicle testing is expected to only have minimal effect on listed species for the following reasons:

- Birds, including eagles and other raptors, that regularly use habitats on RSA already experience regular loud jet aircraft flying nearby and rocket testing noise and may not react strongly to this short-term test event.
- Human activity before the test would likely cause birds and other mobile species of wildlife to leave the area before the test, reducing the number of individuals that would be exposed to the loudest noise levels.
- Only 16 tests per year are anticipated.
- The noise level would return to near ambient levels within 120 to 200 seconds.

The component of the exhaust stream that is of concern to biological resources is the hydrogen fluoride. Using the rated scrubbing rate and the maximum test duration, each test could result in the operational release of no more than 9.5 kilograms (21 pounds) of hydrogen fluoride along with the 57,000 liters (15,000 gallons) of water exhausted as superheated steam. Using the U.S. EPA-approved screening model, TSCREEN/PUFF, it was calculated that the maximum instantaneous concentration of hydrogen fluoride would be 6.27 milligrams per cubic meter (7.6 parts per million). As noted in section 4.1.1, this model uses conservative measures to obtain the highest possible concentrations. Actual

concentrations are anticipated to be significantly lower than those predicted through modeling (due to variations in weather and the initial buoyancy of the exhaust cloud).

The hydrogen fluoride would be emitted as a gas and would remain a gas unless exposed to meteorological conditions of humidity greater than 90% and temperatures less than 50 degrees F. Under these more extreme circumstances the hydrogen fluoride could be converted into particles. However, even as a particulate, the hydrogen fluoride would still have a small size and would tend to act as PM-10 and due to its small size would tend to remain in the exhaust cloud. In either form the hydrogen fluoride would tend to be adsorbed into any water source with which it came in contact as the cloud dispersed. Under normal circumstances the cloud would be highly dispersed before coming into contact with the ground and as such deposition of hydrogen fluoride in any given area would be extremely low and would have minimal impact on surface water pH levels.

As an example, we assume the maximum instantaneous airborne concentration noted above (6.27 milligrams per cubic meter) is deposited on a 1-meter square area of water with a pH of 7 and an alkalinity of 25 milligrams per liter (Calcium Oxide equivalent). Further assuming the deposited hydrogen fluoride reacted with only the first 3 inches of water, the total volume of water in the reaction would be 75 liters (20 gallons). The total available alkalinity would be approximately 1,890 milligrams calcium oxide, only 3.15 milligrams of which would be required to neutralize the 6.27 milligrams of hydrogen fluoride deposited in this example. Therefore, there would be negligible loss of alkalinity. The overall pH of the system would also not be subject to change.

In systems with low mixing dynamics (slow current or no flow), it is possible that a thin acid layer would temporarily form over a more basic layer. If it occurred, this layering effect would be transitory and would be lessened by water flow or animal movements in the water.

Under rainy conditions, it is possible that the exhaust could be deposited in a smaller area, resulting in a greater amount of hydrogen fluoride in any given area. However, rain levels sufficient to wash the hydrogen fluoride from the exhaust cloud would also serve to dilute the acid and mitigate its impact on surface waters. Wind levels during such rain events would also serve to disperse the hydrogen fluoride even as the rain serves to concentrate it. The base pH of the rain would further serve to buffer any system to which the hydrogen fluoride is introduced. Rain has a pH range of approximately 4-8 under normal circumstances and the addition of the small amount of hydrogen fluoride would not be likely to cause a significant change in the pH of the rainfall. As such, hydrogen fluoride that is adsorbed into rain would not be likely to have a measurable impact.

The species of major concern due to a potential for impacts by hydrogen fluoride deposition is the green salamander, which breeds in the area from January through March. While no lethal toxicity problems are expected for adult salamanders, the potential exists for impacts to their eggs. Larval stages of aquatic amphibians are most affected by acidic water. As a rule, embryos of sensitive amphibian species are killed by water with a pH of 4.5 or lower, and embryos of more tolerant species can survive down to a pH of 3.7. Soil

acidification can influence the species of salamander that breed and spend their lives in the soil, such as the green salamander (National Park Service, 1999). Emissions from LTF activities are expected to only slightly reduce current pH levels, which would not result in lethal levels of pH or any long-term impacts to amphibians in the area.

4.3.3.2 Cumulative Impacts

Cumulative impacts would be similar to those discussed in section 4.1.3.2.

4.3.4 RSA CULTURAL RESOURCES

4.3.4.1 Environmental Effects

Prehistoric and Historic Archaeological Resources

Two archaeological sites recorded within the LTF test facility ROI (site 1Ma 630 and 1Ma 269) are currently believed to be potentially eligible for inclusion in the National Register (Curry, 1998). The cemetery located between igloos 8307 and 8308 is not eligible. Site 1Ma 630 is located within the direct ground disturbance area and would likely be damaged or possibly destroyed by LTF construction. Site 1Ma 269 is within the ESQD and would only be affected in the event of an unexpected explosion. Based on initial consultation with the Alabama SHPO, if RSA is selected for the LTF, a Phase II study would be required for site 1Ma 630, and appropriate additional mitigation measures, if necessary, would be developed. Continued consultation with the SHPO and development of appropriate mitigation measures would offset the potential impacts to site 1Ma 630 and site 1Ma 269.

In addition, because archaeological sites, artifacts, and features occur throughout RSA, as well as within, or adjacent to, the LTF ROI, there is some potential for additional cultural materials to be unexpectedly discovered during the course of project activities. In the event this should occur anywhere within the LTF ROI, all activities would halt in the immediate area and the Alabama SHPO would be consulted through the RSA Environmental Office. Subsequent actions would follow guidance provided in 36 CFR 800.11 and/or in NAGPRA.

The un-numbered historic archaeological site located within the LTF I&T Complex has been determined to be eligible for inclusion in the National Register and has been included in the National Register registration form submitted for the Harris House. All three historic features within this area (i.e., the Penland-Cooper cemetery, the Harris House, and the archaeological site) would be protected from disturbance and visual intrusion through buffering and avoidance; therefore, no effects on these properties would occur. The amount and type of buffering would be determined through consultation between the RSA Office of Environmental Management and the Alabama SHPO (Dunn and Wu, 1998).

Although cemeteries at RSA are not National Register-eligible, they are protected and cared for by the installation nonetheless. The un-named cemetery located between igloos

8307 and 8308 would be maintained by the LTF program through monthly mowing and maintenance of the fence (Dunn and Wu, 1998). Any ground disturbance within 30 meters (100 feet) of the cemetery fence would require coordination with the RSA Office of Environmental Management to ensure that no graves are disturbed. The un-named cemetery located between igloos 8307 and 8308 is not eligible for inclusion in the National Register and is not in the direct ground disturbance area; therefore, no effects on historic properties are expected to occur.

Historic Buildings and Structures

Of the currently identified National Register-listed buildings and structures, none are located within the ROI for the LTF program; therefore, there would be no effects on these historic properties.

The Harris House, Penland-Cooper cemetery, and an unnamed archaeological site would be protected from disturbance and visual intrusion by LTF activities through avoidance and buffering; therefore, no effects on this property are expected. The amount and type of buffering would be determined through consultation between the RSA Office of Environmental Management Planning and the Alabama SHPO.

Five World War II-era igloos are located within the direct ground disturbance area of the LTF test facility and will need to be demolished for the construction of the new facility; 65 additional igloos are located within the ESQD. All 70 igloos, as well as Building 8027, have been evaluated for eligibility for inclusion in the National Register in recent World War II and Cold War properties studies of RSA and preliminarily determined to be ineligible; however, concurrence from the Alabama SHPO has not yet been received. Until concurrence from the SHPO is received, these properties must be treated as potentially eligible for inclusion in the National Register for the purposes of this analysis. Modification of Building 8027 or demolition or damage to the igloos from either the direct ground disturbing activities or an unexpected explosion could constitute an adverse effect under cultural resources legislation and a significant impact under NEPA. Although the five igloos (structures 8330, 8331, 8338, 8339, and 8340, which are in the PTC Complex construction area) and Building 8027, which may require modification, have been preliminarily determined ineligible for listing in the National Register, concurrence from the Alabama SHPO has not yet been received. Therefore, before these properties can be modified or demolished, consultation with the Alabama SHPO is required. Mitigation measures to offset potential adverse effects could include recordation through standards acceptable by the Historic American Buildings Survey/Historic American Engineering Record division of the National Park Service, or other such mitigation measures determined to be appropriate during the consultation process.

The remaining 65 igloos, which may also be eligible under the Cold War historic context, are not within the direct ground disturbance area; however, they are located within the LTF ESQD and have the potential to be damaged in the event of an unexpected explosion. Mitigation measures to offset potential effects on these 65 structures are not proposed because the probability of such an occurrence is low and the cost of mitigation (e.g., Historic American Building Survey/Historic American Engineering Record recordation) is

high. In the unlikely event that a mishap occurs, post-mishap recommendations include post-event inspection, non-archival quality 35-millimeter photography, and documentation revisions (e.g., the World War II and Cold War studies) to determine and record the extent of the damage from impacts or fire. Consultation with the SHPO regarding the National Register status of the structures and the types of mitigation required would be conducted through the RSA Office of Environmental Management (Dunn and Wu, 1998; Wu 1999).

Native Populations/Traditional Resources

There are no formally identified traditional cultural properties within the ROI for LTF activities; therefore, no effects are expected.

4.3.4.2 Cumulative Impacts

There are no past, present, or reasonably foreseeable future programs identified within the ROI for the LTF program; therefore, no cultural resources cumulative impacts would be expected to occur.

4.3.5 RSA GEOLOGY AND SOILS

The construction and operational impacts associated with the proposed project at RSA would be similar to those discussed for the Cape Canaveral AS alternative location (see section 4.1.5).

4.3.5.1 Environmental Effects

Construction

As previously mentioned, construction of the LTF at RSA would result in the disturbance of more than 2 hectares (5 acres) of land and, therefore, would be subject to NPDES construction permit requirements. Compliance with the NPDES SWPPP would minimize soil erosion and pollutant discharges during construction. In addition, compliance with the SPCC Plan would minimize the potential for accidental spills of hazardous chemicals to affect project soils. As a result, construction-related impacts to geology and soils are considered minor.

Operation

Soils in the area of LTF operations are moderately to strongly acidic (average pH levels range from approximately 4.5 to 5.1) (Iowa State University Statistical Laboratory, 1998). Due to the low buffering capacity of the soils, the deposition of small amounts of hydrogen fluoride may result in a temporary and slight increase in soil acidity. However, because hydrogen fluoride deposition on soil surfaces would occur only during periods of high humidity and because hydrogen fluoride is highly soluble in water, small amounts of hydrogen fluoride residuals would be quickly diluted and buffered by rainfall. As a result, LTF operations are not expected to result in long-term changes in the chemical composition or physical characteristics of soils located within the project's ROI. However,

temporary increases in soil acidity may result in short-term impacts to vegetation and soil-dwelling microorganisms.

Compliance with the NPDES SWPPP would minimize soil erosion and pollutant discharges during project operations. Compliance with the SPCC Plan would minimize the potential for accidental spills of hazardous chemicals to affect project soils. Operational activities are not expected to result in long-term changes in the chemical composition of soils located within the project's ROI.

Because RSA is located in a low seismic risk area, the potential occurrence of liquefaction, seismic settlement, or ground rupture at the project sites is considered minimal. In addition, soil at the LTF sites exhibits low to moderate shrink/swell susceptibility. Potential geotechnical problems associated with the construction of the LTF at RSA are considered minor.

4.3.5.2 Cumulative Impacts

Temporary, minor impacts to geology and soils, when combined with other current and foreseeable future activities, would not result in cumulative impacts.

4.3.6 RSA HAZARDOUS MATERIALS AND HAZARDOUS WASTE MANAGEMENT

For a discussion and description of the hazardous materials and hazardous wastes associated with LTF, see section 4.1.6.

4.3.6.1 Environmental Effects

Construction of an LTF would use small amounts of hazardous materials and hazardous wastes, primarily paints, oils, and solvents. In addition, construction of the LTF facilities would require the demolition and renovation of existing structures. The demolition of structures with ACM has a potential for releasing asbestos fibers into the air. Asbestos fibers could be released due to disturbance or damage of various building materials such as pipe and boiler insulation, acoustical ceilings, sprayed-on fireproofing, and other material used for soundproofing or insulation. Testing for ACM is necessary if the absence of asbestos cannot be verified. Similarly, suspected lead-based paints and PCBs encountered during any demolition requires testing and special handling. Paints that exceed the limits for lead must be removed in accordance with the applicable health and safety standards and disposed of as hazardous waste. PCB-contaminated equipment must be either retrofilled with non-PCB dielectric fluid and the PCB-contaminated fluid disposed of as PCB waste, or the entire piece of equipment must be disposed of as PCB waste. Depending on the concentrations, typical PCB waste disposal may be by incineration or landfilling in a specially permitted facility.

The operation and maintenance of the LTF at RSA would increase the amounts of hazardous materials used and hazardous wastes generated at the facility. These

hazardous materials and hazardous wastes listed in table 2-6 include paints, solvents, acids, bases, ethylene glycol, and alcohol, as well as hydrogen fluoride- and sodium fluoride-contaminated wastes. These hazardous materials are similar in type and quantity to those currently being used at RSA. RSA and NASA permits can absorb the additional burden of hazardous wastes from LTF activities. Procedures, personnel, and facilities are in place to manage the additional hazardous materials and wastes. Pollution prevention efforts as defined by RSA's Pollution Prevention Plan would apply to LTF activities.

4.3.6.2 Cumulative Impacts

The additional quantities of hazardous materials or hazardous wastes, when added to existing and expected future programs, would not adversely affect existing permits or programs at RSA. Therefore, cumulative impacts relative to hazardous materials or hazardous wastes are not expected.

4.3.7 RSA HEALTH AND SAFETY

4.3.7.1 Environmental Effects

Construction

Few existing structures would be used at RSA. Five igloos would be demolished after determining the contents and any asbestos had been removed. Preparation for new construction includes clearance of existing vegetation, grading, and excavation for foundations. An area would be prepared for construction equipment laydown, personal vehicle parking, temporary mobile offices (trailers), maintenance facilities, and other construction needs. Concrete for foundations and footings and other construction materials would be delivered by truck in accordance with DOT and RSA regulations. The tall structures proposed for this action present fall hazards during construction. Construction activities would be conducted in accordance with OSHA and USACE requirements for health and safety to control exposure to occupational safety and health hazards.

Operations—General Considerations

See section 4.1.7.1 for a description of environmental effects of LTF operations.

Operations—RSA

The 6-hectare (15-acre) PTC Complex would encompass or impact access to several igloos. The 550-meter (1,800-foot) inhabited building ESQD would encompass many igloos and would impact the access to most of the igloos in the area of LTF. When the ESQD is active during fueling, access to igloos in the area of the LTF would be suspended.

The 1.2-kilometer (0.75-mile) Laser Safety Zone would encompass all igloos in the southern area of RSA. Access to these igloos would be suspended for 2 hours, 16 times per year, when the Laser Safety Zone is active.

The dispersion of the exhaust emission from the PRS would be modeled for meteorological conditions before each test. When modeling indicates the concentration of hydrogen fluoride would exceed the exposure criterion of 3 ppm at the boundary of the exclusion zone, the test would be delayed until more favorable meteorological conditions prevail.

Facility and equipment designs would incorporate measures to minimize the potential for and impact of accidental releases. Operating procedures and training would be instituted to minimize the potential for and impact of releases of hazardous materials. Appropriate emergency response plans would be established and implemented to deal with potential chemical releases.

4.3.7.2 Cumulative Impacts

All work on the Proposed Action would be performed in accordance with applicable health and safety regulations. No injuries or illnesses are anticipated. No other activities have been identified within the ROI that when combined with the Proposed Action would have a cumulative impact on health and safety.

4.3.8 RSA LAND USE AND AESTHETICS

4.3.8.1 Environmental Effects

Regional Land Use

The proposed project would be located at the extreme southern portion of RSA, which is surrounded by the Tennessee River to the south and the remainder of RSA to the north. Therefore, construction and operational activities would not affect adjacent offsite land uses. No noise related impacts on adjacent land use are anticipated because noise should be below background noise levels at the 1.2-kilometer (0.75-mile) Laser Safety Zone radius. See the Chapter 4 sections on noise for additional noise information.

On-base Land Use

Construction and operation of new facilities in the PTC Complex would occur on approximately 6 hectares (15 acres) in the southern part of RSA, which falls under the ammunition supply land use category. Although the proposed PTC Complex is not considered ammunition supply, the facility and site operations (including the inhabited building ESQD and the Laser Safety Zone) would be compatible with the open nature of the base and existing types of activities, and is consistent with overall base objectives. However, there are storage igloos currently used within the ESQD and the Laser Safety Zone. Further determination would be required for igloos used for storage within the ESQD boundary. Depending on the types of materials stored and the distance from the PTC Complex, some materials may have to be relocated to other storage igloos. Use of the storage igloos within the ESQD would be coordinated to avoid conflict with LTF testing. Igloos that are located outside the ESQD but within the Laser Safety Zone would still be utilized for storage but would not be accessible during times of testing. The I&T Complex would occur on approximately 10 hectares (25 acres) located in the Test and

Operations area of RSA and would be a compatible land use. Up to 20 hectares (50 acres) could be disturbed during the construction phase, which includes a 4-hectare (10-acre) construction laydown area along the road to the PTC Complex. The proposed facilities and operations would not result in a conversion of prime agricultural land or cause a decrease in the utilization of the land.

Aesthetics

New construction could slightly alter the views surrounding RSA. Several of the proposed facilities would be approximately 61 meters (200 feet) tall, which is not out of character with some of the other structures on RSA. Views of the proposed site are very limited. It is in the extreme south-central portion of the base and is surrounded by the Tennessee River to the south. The area is fairly hilly and is heavily forested. Therefore, construction and operations of the proposed LTF would not affect the area's aesthetic quality nor would it obstruct any scenic views.

4.3.8.2 Cumulative Impacts

In terms of potential for cumulative impacts, the proposed PTC Complex site currently consists of mostly vacant ammunition storage igloos. These igloos were built around 1950. Before then, the site was primarily dominated by forest vegetation. The proposed I&T Complex currently consists of vacant land with forest vegetation. The conversion of the bunkers to accommodate the PTC Complex and the construction of the I&T Complex would affect less than 1 percent of RSA. It would not create a cumulative change, and the Laser Safety Zone around the facility would not disturb the land use. The proposed LTF program would not contribute to any cumulative land use impacts.

4.3.9 RSA NOISE

A general discussion of noise is given in section 4.1.9.

4.3.9.1 Environmental Effects

Potential impacts from LTF program activities could come from noise generated by construction equipment during construction activities and from noise generated by the PRS during operational activities.

Construction

At a distance of approximately 15 meters (50 feet) the noise from typical construction equipment falls in the range of 70 dBA to 100 dBA (with peak noise from pile drivers going as high as 110 dBA) (U.S. Environmental Protection Agency, 1971). As such, under most meteorological conditions, all construction noise would be anticipated to attenuate to 85 dBA at a radius of approximately 270 meters (890 feet) from the construction site. As no point on the RSA facility boundary is anticipated to be closer

than this, then no noise impacts to the public from construction noise would be anticipated.

Operation

While it is operating, the PRS is anticipated to generate a noise level of approximately 125 dB at a distance of 15 meters (50 feet) from the end of the PRS ejectors. Assuming no attenuation due to intervening structures or vegetation, the noise from such a source would attenuate to approximately 85 dB at a radius of approximately 1.0 kilometers (0.64 mile). As this would be within the 1.2-kilometer (0.75-mile) Laser Safety Zone, no impacts to the noise environment would be anticipated from the operation of the PRS. This is especially true because operation of the PRS would be only a few minutes duration approximately 16 times per year.

The PRS would be built such that the ends of the ejectors are not aligned in the direction of known noise sensitive receptors. Noise barriers, such as walls or groups of trees, could also be placed between the ends of the PRS ejectors and noise sensitive receptors to further reduce the potential for impacts.

4.3.9.2 Cumulative Impacts

Noise impacts for RSA would include those from current programs and those expected from LTF activities. Most of these noises are intermittent and are not expected to cumulatively impact the area.

4.3.10 RSA SOCIOECONOMICS

4.3.10.1 Environmental Effects

The Proposed Action would comprise two components or phases; the construction phase and the operational phase.

Construction

The Proposed Action at RSA would start with a construction phase of new and refurbished facilities. The construction program would be expected to draw on local resources including labor and material. It is estimated that the total construction cost of the buildings required at RSA, including labor and materials, would be about $97.05 million.

The construction phase would generate 1,208 full-time equivalent construction jobs that would create $29.83 million in wage income. This wage income would translate into personal consumption expenditure of $24.15 million. In addition, the construction program would require the purchase of raw materials and finished building products. It is estimated that these purchases would equal about $40.7 million.

These jobs and expenditures would be substantial, yet transitory, benefits for the local economy. The result of the construction program, however, would be an operational facility that would generate recurring economic benefits.

The construction phase, because it would be carried out away from inhabited areas, would not be expected to effect the quality of life of local residents or visitors to RSA and its surrounding communities of Huntsville and Madison.

Operation

The operational parameters of the Proposed Action would be identical to those outlined at Cape Canaveral. A total of 350 jobs and $7.47 million of annual household income would be created directly by the first phase of the action and indirectly in the local economy via the multiplier effect.

The second phase of the Proposed Action would require 170 personnel. If these jobs were new to the local economy, they would generate $5.26 million of direct consumption expenditure, 654 direct and indirect jobs, and $13.94 million of direct and indirect annual household income.

The creation of these new jobs could have the potential to increase demand for new homes and local services, including health, education, and other publicly-provided facilities. If every job created by the Proposed Action brought with it a typical U.S. household (2.64 persons in 1997), then 91 first phase jobs would bring 240 people and 170 second phase jobs, 449. If all of those moving into the area came from outside of the regional economy, then the population of the region would increase by a maximum of less than 0.1 percent. The current forecast increase in population between 1997 and 2005 (based on existing demographic trends) is about 55,700. The potential increase in population attributed to this action would, therefore, require an increase of the forecast by less than 1 percent.

Operational impacts on the quality of life would be minimal due to the relative isolation of the testing site at RSA and the non-invasive character of the Proposed Action.

4.3.10.2 Cumulative Impacts

The local and regional growth forecasts imply that the additional jobs created in the community would not add significantly to the existing trends.

The positive monetary impacts of the Proposed Action would help sustain current economic growth plans and forecasts for the region.

4.3.11 RSA TRANSPORTATION

4.3.11.1 Environmental Effects

Roadways

It is proposed that RSA roads be used for bringing components into the arsenal for test and integration. In order to transport SBL program critical items, the use of a kneel-down transporter with a space station shipping container may be necessary. Its capacity is 354 metric tons (390 tons) payload weight, and it has a 17 by 6-meter (56 by 20-foot) bed. Wide, high-capacity area roadways are available for transporting oversized loads. RSA roadways directly affected by LTF activities include McAlpine Road, a 2-lane, north-south route, Blueberry Road (Laser Test Complex), and north Buxton Road. No modifications would be needed for the project, except as discussed below, and all modes of transportation at Redstone/MSFC are currently maintained and operational. (Redstone Arsenal, 1998a)

During the LTF construction phase, additional traffic is estimated at approximately 800 vehicle trips per day and 10 truck trips per day, with a peak of 50 truck trips per day. Operations traffic would generate approximately 240 vehicle trips per day and 1 truck trip per day.

The anticipated vehicle trips would occur along Blueberry Road, north Buxton Road, and Rideout Road. Recent ADT counts for Buxton and Rideout gates indicated ADT levels of 2,800 and 6,500 vehicles respectively. During construction, LTF project demands would increase current traffic levels at Buxton Gate by approximately 14.5 percent and at Rideout Road by approximately 6.2 percent; traffic during the Operations phase would be less than one-third of this amount. Capacity of the roads is unavailable. Project demands would require widening of Blueberry Road, but the very limited traffic in this area would be rerouted to other roads in the immediate area with little or no inconvenience to area traffic.

Transportation of hazardous materials would be accomplished in accordance with DOT regulations for interstate shipment of hazardous substances.

Waterways

Barge-loading docks on RSA, as well as a supporting road system capable of handling heavy cargo, would allow direct access to deep-water transportation (National Aeronautics and Space Administration, 1997b). Barge transport of the RD vehicle at the conclusion of the test program would be accommodated with minimal impacts. The distance from the proposed LTF sites to the barge dock is approximately 6.1 kilometers (3.8 miles). If cargo height exceeds the bridge clearance for the Tenn-Tom waterway, the Tennessee-Ohio-Mississippi route would be utilized. Although this would increase the total shipping time, the rerouting is a routine procedure and would not impact waterway traffic.

Railways

Where warranted, RSA railways and roads could be used up to three times per year for conveying components for test and integration (Redstone Arsenal, 1998a). However, these facilities are only occasionally utilized, and on an as-needed basis (U.S. Department of the Air Force and National Aeronautics and Space Administration, 1993). Any increase in demand of railway facilities would necessitate upgrading and renovation. No impacts to the current, limited railway traffic levels are expected.

Airways

The Redstone Army Airfield would be used approximately three times per year for shipping and receiving LTF-related components (Redstone Arsenal, 1998a). Both NASA and NASA-related and civil flights require advance permission before landing (Marshall Space Flight Center, Environmental Engineering and Management Office, 1997). Scheduling would help avoid transportation impacts or conflicts with day-to-day traffic levels. No modifications would be needed, as the airfield is currently maintained and operational (Redstone Arsenal, 1998a). Huntsville International Airport would also be available.

No modification to or new construction for the existing transportation network would be required or anticipated for the project, and all modes of transportation at Redstone/MSFC are currently maintained and operational (Redstone Arsenal, 1998a). Any impacts to traffic levels would be negligible.

4.3.11.2 Cumulative Impacts

No transportation impacts are expected outside of RSA boundaries. Traffic levels in the immediate area of Blueberry Road are extremely low and somewhat removed from typical day-to-day operations on the base. Barge operations are available for loads considered too heavy or unwieldy for roadway or airway transport. No other programs have been identified that, when combined with LTF-related transportation impacts, would contribute to cumulative impacts to transportation. As such, cumulative impacts are expected to be non-existent or minimal, with no anticipated degradation of transportation quality or increase in travel time.

4.3.12 RSA UTILITIES

4.3.12.1 Environmental Effects

Water Supply

Water requirements for LTF construction (table 2-3) would be 0.2 percent of the current RSA average daily use. Combining RSA usage and LTF usage would result in a total usage of 57 percent of the available water supply.

Monthly water requirements for LTF operations (listed in table 2-4) would be 0.1 percent of current use, and when combined with the current RSA usage would result in a total usage of 57 percent of the available water supply.

Annual water usage would increase, but would not overload the RSA capacity. There is a 15-centimeter (6-inch) water line running parallel to McAlpine Road approximately 305 meters (1,000 feet) from the PTC Complex.

Wastewater

Wastewater treatment facilities are currently operating at less than capacity. Given the RSA WWTP's designed 13.6 million-liter (3.6 million-gallon) per day average capacity, 22.7 million-liter (6.0 million-gallon) per day peak 24-hour capacity, average flow rate of 9.1 million liters (2.4 million gallons) per day, and peak demand of 34.1 million liters (9.0 million gallons) per day, additional wastewater generated as a result of personnel increases and project activities at RSA would be negligible. Potential tie-ins with the City of Huntsville offer even greater capacity.

The existing permit covers the drainage network for treated industrial wastewater, but may require modification depending on the effluent resulting from LTF activities. A State Indirect Discharge permit may also be required for purge water. Sewer lines are available at Building #8027, (EDAW, Inc., 1998c) but would have to be extended to the LTF site on Blueberry Road (Burroughs, 1998) from the 61-centimeter (24-inch) and a 15-centimeter (6-inch) force main running parallel to Buxton Road, some 2,930 meters (9,600) feet away. Existing sanitary sewer system capacity can accommodate the anticipated LTF load.

During LTF construction, a temporary concrete batch plant would be erected at the site, and water from the plant would be captured and collected in a retainment or detainment pond (depending upon the requirements of the site). Wastewater would be treated and disposed of in accordance with existing permit limitations.

Yearly wastewater levels for LTF construction are listed in table 2-3. Based on 250 working days per year, average capacity for wastewater at RSA would be approximately 3.4 billion liters (900 million gallons). Maximum LTF demands would be 0.005 percent of the current capacity.

Given the average RSA daily capacity, average monthly capacity (based on the assumption of 20 working days per month) would be 273 million liters (72 million gallons). The estimated monthly wastewater level generated during LTF operation can be found in table 2-4. This demand would be 0.1 percent of the average demand.

Solid Waste

The RSA inert landfill would handle construction and demolition debris or similar wastes at a rate of 459 cubic meters (600 cubic yards) per day. The landfill's capacity exceeds the

current daily demand by 36 metric tons (40 tons), allowing (given 20 working days per month) space for 726 metric tons (800 tons) per month. Where practicable, solid waste would be recycled. The construction contractor would handle removal of construction debris; unused cut and fill material would be transported from the project area to an approved spoil site.

Various types of solid waste/debris would be generated during LTF construction; the estimated amount of 45 metric tons (50 tons) per month would be 6.25 percent of the remaining capacity. Huntsville's Waste-to-Energy plant would also be available to handle solid wastes.

This level of solid waste generation would slightly increase the volume of waste generated by RSA. Impacts from LTF operations on solid waste treatment/generation would be minor. Additional demands on RSA solid waste disposal resulting from proposed project demands and personnel increases would be negligible.

Energy

RSA has access to a 182,108 kVA electrical supply. The average daily electrical use is approximately 52,900 to 75,500 kVA, and peak demand is approximately 80,000 kVA. (Redstone Arsenal, 1998) Existing transmission lines are adequate for LTF needs. A 44-kV line, located at the intersection of Buxton and Pershing Roads (fed from substation 3), and a separate source at the Patton-Buxton intersection (fed from substation 2), have the capacity to support project demands. However, an extension of 5 kilometers (3 miles) of new 44-kV lines and 2.4 kilometers (1.5 miles) of new 15-kV underground lines, as well as a new substation, would be required. Monthly electricity demand during LTF operation would be 250,000 kWh, a 0.73-percent increase of the current demand. Even combined with the peak demand, this would be approximately 44.7 percent of the available capacity, well within the system's capabilities.

Monthly LTF gas requirements of 1,000 therms can be met with certain modifications, including a connection to the 15-centimeter (6-inch) gas line, which terminates at the Pershing-Buxton road intersection 3,719 meters (12,200 feet) away from the LTF site. If needed, Huntsville Utilities would provide a line to the site (Burroughs, 1998). Demand on Huntsville natural gas capacity amounted to 65 million therms in 1998 (Huntsville Utilities, 1999); LTF monthly requirements would amount to a 0.002-percent increase in demand. The city's current demand, combined with LTF requirements, would be less than 41 percent of available capacity.

Additional demands on the RSA energy systems by the Proposed Action would be insufficient to cause detrimental infrastructure impacts, and would thus be negligible.

4.3.12.2 Cumulative Impacts

Proposed project activities, when combined with current demands upon RSA utilities, should have minimal to no impacts outside of RSA facilities and, therefore, no cumulative

impacts are anticipated. The additional personnel are not expected to appreciably impact the facilities of either the City of Huntsville or Madison County. No other programs have been identified that, when combined with the LTF requirements, would contribute to cumulative impacts.

4.3.13 RSA WATER RESOURCES

Surface and ground water impacts associated with LTF construction and operational phases at RSA are similar to those discussed for the Cape Canaveral AS alternative location (see section 4.1.13).

4.3.13.1 Environmental Effects

Construction

Construction of the LTF at RSA would result in the disturbance of more than 2 hectares (5 acres) of land and, therefore, would be subject to NPDES construction permit requirements. Compliance with the NPDES SWPPP would minimize soil erosion and pollutant discharges during construction. In addition, compliance with the SPCC Plan would minimize the potential for accidental spills of hazardous chemicals to affect surface and groundwater resources. As a result, construction-related impacts to water resources are considered minor.

Operation

Surface waters near RSA are slightly acidic to alkaline. Average pH levels range from a low of 6.9 along portions of McDonald Creek to a high of nearly 7.4 along Indian Creek (U.S. Army Missile Command, 1994). Due to the natural buffering capacity of nearby surface waters, the deposition of small amounts of hydrogen fluoride are anticipated to result in only minor and temporary decreases in water pH. Small amounts of hydrogen fluoride deposited on water surfaces would quickly dissipate due to surface water mixing and the natural buffering capacity of the surface waters.

The risk of accidental releases of hazardous materials or wastes is considered minimal. All activities conducted on the project site would be required to comply with the SPCC Plan, to be developed and implemented as part of this project. Compliance with the SPCC Plan would minimize the potential for accidental spills of hazardous chemicals to affect surface and groundwater resources. Proposed LTF activities would require adding a downstream monitoring point to the existing storm water permit (EDAW, Inc., 1998c).

Operations at RSA, including the proposed LTF site, would be required to comply with NPDES industrial permit requirements. Treated storm water is currently discharged to local water courses in compliance with a NPDES industrial permit administered by the ADEM. Any change in design, construction, operation, or maintenance of facilities that results in an increase of pollutant discharge to State waters would require application for a NPDES permit (or amendment of an existing applicable permit) and potential revisions to

the SWPPP. The Proposed Action would require an amendment of the existing NPDES industrial permit for inclusion of wastewater discharges associated with the operation of the proposed facilities. Compliance with NPDES requirements and the SWPPP would minimize pollutant discharges during project operations.

EO 11988 directs Federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with occupancy and modification of floodplains. Areas proposed for LTF activities are located within previously constructed areas that are currently elevated above the 100-year floodplain. As a result, risk of flooding at the project site is considered minor.

4.3.13.2 Cumulative Impacts

No other activities that would impact water resources have been identified at the proposed LTF locations. No future programs have been identified that when combined with the Proposed Action would contribute to cumulative water resources impacts.

4.3.14 RSA ENVIRONMENTAL JUSTICE

4.3.14.1 Environmental Effects

EO 12898 requires that Federal agencies identify and address disproportionately high and adverse environmental effects (including human, health, and economic and social effects) of its programs, policies, and activities on minority and low-income populations. An environmental justice impact would be a long-term health, environmental, cultural, or economic effect that has a disproportionately high and adverse effect on a nearby minority or low-income population, rather than all nearby residents. The potential for a disproportionately high and adverse effect could occur under either of two conditions: (1) the percentage of persons in low-income or minority populations in the census tracts exceeds the percentage in the county, the region of comparison, or (2) the percentage of low-income or minority population in the census area exceeds 50 percent.

Construction and operation of the LTF at RSA would not disproportionately affect any minority or low-income populations. The potential environmental or human health impacts noted above would be contained within the RSA boundary and would not impact any populated areas. No Native American or traditional cultural resources would be impacted from LTF construction and operation.

4.3.14.2 Cumulative Impacts

No other projects or activities in the region along with LTF have been identified that would contribute to potential cumulative environmental justice impacts.

4.4 STENNIS SPACE CENTER

4.4.1 SSC AIR QUALITY

4.4.1.1 Environmental Effects

Potential impacts to air quality at SSC are similar to those described in section 4.1.1 for Cape Canaveral AS.

Construction

Construction activities would disturb up to approximately 20 hectares (50 acres) for a period of up to 30 months. Table 4.4.1-1 presents the estimate of potential construction emissions due to the proposed construction at SSC using the procedure and assumptions outlined in section 4.1.1.

Table 4.4.1-1: Potential Construction-related Emissions at Stennis Space Center

Pollutant	Year One[1] Metric Tons (Tons)	Year Two Metric Tons (Tons)	Year Three[2] Metric Tons (Tons)
Carbon Monoxide	14.04 (15.48)	14.04 (15.48)	7.02 (7.74)
Oxides of Nitrogen	18.95 (20.89)	18.95 (20.89)	9.47 (10.44)
Oxides of Sulfur	1.01 (1.11)	1.01 (1.11)	0.50 (0.55)
PM-10	146.28 (161.25)	1.90 (2.10)	0.95 (1.05)
Reactive Organic Gases[3]	6.30 (6.94)	6.30 (6.94)	3.15 (3.47)

Source: Derived from Sacramento Metropolitan Air Quality Management District, 1997.

[1]Emissions estimate includes all fugitive dust emissions due to grading.

[2]Emissions during year three are limited to six months of construction.

[3]Reactive Organic Gases are similar to VOCs, but include additional gases. It is used here as a conservative estimate of VOC emissions.

PM-10 = particulate matter with a mean aerodynamic diameter of a nominal 10 micrometers

Specific facility design has not progressed to the point where it is practical to predict maximum construction-related ambient levels of PM-10 or exhaust products. However, construction of the LTF would be carried out using standard construction methods, including normal dust suppression measures, appropriate for this size construction project. As such, while construction activities would be expected to cause increases in air pollutants, it is anticipated that these emissions would not cause exceedances of the NAAQS or state AAQS beyond the bounds of the construction area. In addition, construction activity levels in the area would be managed so as to maintain compliance with OSHA workplace health standards.

Dust suppression methods could include periodic watering of exposed soils, chemical stabilization of inactive areas, and wind breaks to reduce wind speed and consequent entrainment of dust. Proper tuning and preventative maintenance of construction vehicles

would serve to minimize exhaust emissions and maximize vehicle performance. (U.S. Environmental Protection Agency, 1999c)

Operation

Traffic levels (and mobile emissions) in the MSAAP area are currently lower than they have been in the past. Traffic levels experienced when the MSAAP staff levels were approximately 3,000 people did not degrade local air quality. Mobile emissions due to the proposed action would be less than those experienced in the past. As such, it is reasonable to assume that potential mobile emissions due to the proposed action would also not degrade local air quality.

The LTF would be required to obtain an operating permit that would incorporate all stationary emissions sources. This permit would be expected to take the form of either a Title V Air Permit or a Synthetic Minor Operating Permit. Even though the proposed action does not constitute a major source as per the Clean Air Act, a Title V Air Permit may be a viable alternative in order to allow for future expansion of the site. A last option would be to incorporate the LTF in the current MSAAP operating permit. No final decision has been made regarding the preferred approach and it is expected that none would be made until the facility design was closer to being finalized. In any event, appropriate analysis would be required prior to the issuance of a permit to assure the proposed facility would cause no significant deterioration of air quality. As such, it is anticipated that installation of the LTF would only cause a minor impact to local air quality.

Potential emissions sources would include daily operations (including setup of non-laser testing, site maintenance, and periodic operation of the proposed backup power sources), operation of the backup power sources as required, and the proposed operation of the PRS and PRS boilers. Table 4.1.1-2 summarizes the anticipated emissions due to the operation of the proposed backup power sources (three 750-kilowatt diesel generators).

Each laser test would result in the operational release of less than approximately 9.5 kilograms (21 pounds) of hydrogen fluoride. As indicated in section 4.1.1, these releases would not be expected to cause exceedances of health-based standards beyond the Laser Safety Zone. The Laser Safety Zone would be evacuated prior to operation of the PTC. As such, no operations personnel, base personnel, or members of the general public would be exposed to hazardous levels of hydrogen fluoride due to proposed operation of the PTC.

Laser testing would require the combustion of up to approximately 13,250 liters (3,500 gallons) of diesel fuel for each test in order to heat the PRS boilers. Table 4.1.1-3 provides a summary of the projected boiler emissions. Installation of air pollution control technology would reduce the amount of pollutants emitted by the PRS boilers. The decision as to which control equipment would be appropriate for this facility would depend on the final design specifications.

Table 4.4.1-2 shows the anticipated emissions due to the proposed operation of the PTC and I&T Complexes.

Table 4.4.1-2: Projected Project-related Emissions[1]

Pollutant	Annual Emissions – Metric Tons (Tons) LTF-related Operations Emissions[2]
Carbon Monoxide	3.89 (4.29)
Oxides of Nitrogen	16.93 (18.22)
Oxides of Sulfur	9.18 (10.12)
PM-10	0.29 (0.33)
Volatile Organic Compounds	0.48 (0.53)
Hazardous Air Pollutants	<0.01 (<0.01)

[1]Stationary source emissions only.

[2]Includes backup generator emissions (table 4.2.1-2) and PRS boiler emissions (table 4.2.1-3)

PM-10 = particulate matter with a mean aerodynamic diameter of a nominal 10 micrometers

Mishap Impacts

Potential mishaps and their potential impacts at SSC are similar to those described in section 4.1.1.1. The most likely accidental release would occur during fuel transfer and would be limited to a few ounces of reactant. Due to the greater potential for hazardous releases during refueling, it would only be conducted under meteorological conditions that would not result in hazardous conditions beyond the laser safety zone if a release were to occur. The least likely mishap is one involving the majority of either fluorine or nitrogen trifluoride. If this level of accidental release were to occur under proper weather conditions, it could result in hazardous conditions beyond the laser safety zone (appendix D). The facility Hazardous Management Plan would include the proper responses to accidental releases in order to minimize its impact to the populace and the environment.

4.4.1.2 Cumulative Impacts

No other concurrent construction projects have been identified. However, PM-10 and exhaust emissions generated during construction would add cumulatively to the impacts from other dust sources in the immediate vicinity of the construction site. No exceedance of the NAAQS, state AAQS, or health-based standards of non-criteria pollutants would be anticipated due to proposed construction activities.

Daily operations would add to the area's ambient pollution levels. The LTF would be required to obtain an operating permit and would have a cumulative impact on air quality. However, its installation and operation would be within regulatory limits.

Mobile emissions associated with personnel traveling to and from the sites and associated with operational vehicles would add to the current level of mobile emissions in the area. However, the addition of less than 250 vehicle trips per day is not anticipated to have a measurable impact on the area's air quality.

4.4.2 SSC AIRSPACE

4.4.2.1 Environmental Effects

The following section summarizes the results of applying the obstruction standards contained on FAA Form 7460-6 Obstruction Evaluation Worksheet. It is assumed that the facilities at the PTC and I&T Complexes would be approximately 61 meters (200 feet) AGL and would require a Notice of Proposed Construction. The proposed PTC Complex and I&T Complex are not within 6.1 kilometers (3.8 miles) of Stennis International Airport or the new airport east of Picayune, Mississippi, and therefore do not meet the slope from airport notice criteria (figure 4.4.2-1).

The proposed facilities do not exceed any of the obstruction standards or airport imaginary surfaces standards.

Operation of the LTF would not affect restricted airspace R-4403, located south of the LTF facilities.

4.4.2.2 Cumulative Impacts

No other activities that would impact airspace have been identified at the proposed LTF locations. The submittal of the required Notice of Proposed Construction, and adherence to any determinations made by the FAA, would preclude the potential for cumulative impacts to existing airspace users.

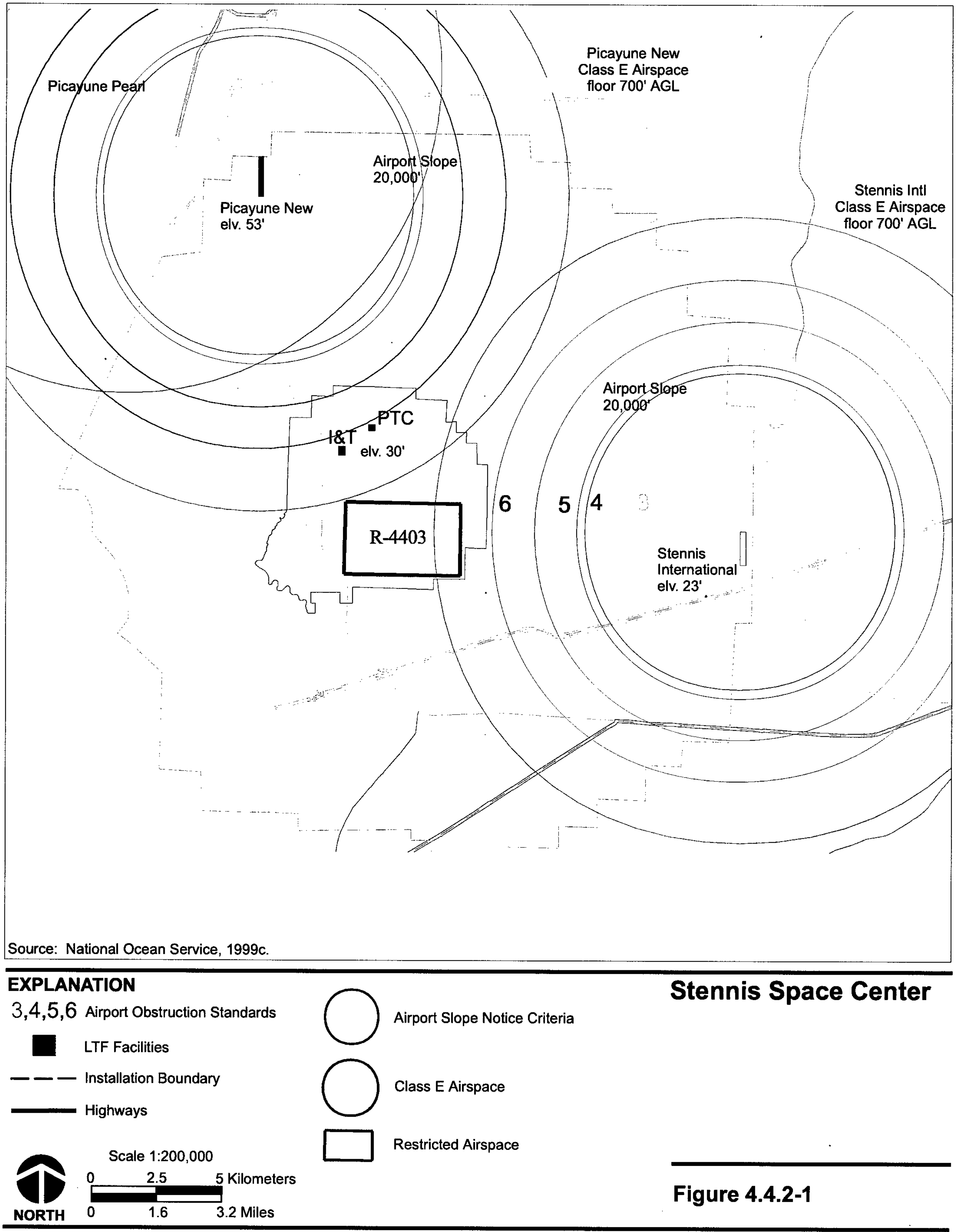
4.4.3 SSC BIOLOGICAL RESOURCES

4.4.3.1 Environmental Effects

The analytical approach for determining effects to biological resources is described in the beginning of section 4.1.3. The following sections discuss the environmental effects of the Proposed Action on biological resources found at SSC.

Construction

The proposed SSC alternative includes construction of the PTC and I&T Complexes within the MSAAP installation. Land in the area is managed for commercial tree harvest, and timber is harvested on a regular basis in accordance with the Natural Resources Management Plan. No threatened or endangered plant species have been identified on the MSAAP installation. No adverse impacts to wildlife have been identified as a result of prior operations on the installation. Although several transient threatened or endangered birds could potentially be observed within the MSAAP, no threatened or endangered wildlife species are known to actually reside on the installation.



Stennis Space Center

Figure 4.4.2-1

The majority of SSC consists of wetlands, and up to 20 hectares (50 acres) could be affected by the proposed activities. Mitigation measures would be developed in coordination with the USACE and the USFWS during the permitting process once a site has been selected and the wetlands identified and delineated. The permitting process would be conducted in accordance with the U.S. EPA's guidelines for evaluating Section 404 permitting applications found in Section 404 (b)(1) of the Clean Water Act. Facility design would attempt to avoid direct and indirect disturbance of wetlands to the extent practicable. Mitigation measures would be developed during the permitting process once a site has been selected. Agency-recommended mitigations would take into account the size and quality of the wetlands involved. Mitigations for wetlands could include: (1) on-installation/base (if possible) replacement of any wetlands lost at a ratio determined through consultation with the USACE; (2) restoration/enhancement of wetland habitat elsewhere on the base or purchase and fencing of any off-base replacement habitat; and (3) monitoring (until habitat becomes well established) of any replacement wetlands as required to determine the effectiveness of replacement and any remedial measures. Because the creation or development of wetlands represents a substantial financial investment, and the process may take several years to complete, this option is often reserved for wetland mitigation of high quality or for a sizable area of affected wetlands. The probability of success that a newly created wetland would survive and flourish could vary, which sometimes makes this option less desirable than wetland restoration or avoidance.

An option for mitigating impacts to wetlands on the MSAAP would be to use several wetlands mitigations areas that have been established by NASA on SSC to compensate for filling wetlands during construction activities. Avoiding disturbance to the wetlands could include controlling runoff from construction and operation sites into the wetland through use of berms, silt curtains, straw bales, and other appropriate techniques. Equipment should be washed in areas where wastewater can be contained and treated or evaporated.

Although removal of vegetation could displace wildlife, it would not result in a substantial reduction in habitat available for wildlife in the area. Construction activities could cause bird species that may be foraging in the area to temporarily avoid the area within approximately 15 meters (50 feet) of the site. However, this would be a short-term effect as described in section 4.1.3.

Operation

A discussion of effects of noise on wildlife is provided in section 4.1.3.1. Noise from the RD vehicle tests has the potential to impact wildlife within the 93 dB and greater noise contours. Overall, the level of noise impacts resulting from RD vehicle testing is expected to only have minimal effect on listed species for the following reasons:

- Human activity before the test would likely cause birds to leave the area before the test, reducing the number of individuals that would be exposed to the loudest noise levels.

- Only 16 tests per year are anticipated.
- The noise level would return to near ambient levels within 120 to 200 seconds.

The component of the exhaust stream that is of concern to biological resources is the hydrogen fluoride. Using the rated scrubbing rate and the maximum test duration, each test could result in the operational release of no more than 9.5 kilograms (21 pounds) of hydrogen fluoride along with the 57,000 liters (15,000 gallons) of water exhausted as superheated steam. Using the U.S. EPA-approved screening model, TSCREEN/PUFF, it was calculated that the maximum instantaneous concentration of hydrogen fluoride would be 6.27 milligrams per cubic meter (7.6 parts per million). As noted in section 4.1.1, this model uses conservative measures to obtain the highest possible concentrations. Actual concentrations are anticipated to be significantly lower than those predicted through modeling (due to variations in weather and the initial buoyancy of the exhaust cloud).

The hydrogen fluoride would be emitted as a gas and would remain a gas unless exposed to meteorological conditions of humidity greater than 90% and temperatures less than 50 degrees F. Under these more extreme circumstances the hydrogen fluoride could be converted into particles. However, even as a particulate, the hydrogen fluoride would still have a small size and would tend to act as PM-10 and due to its small size would tend to remain in the exhaust cloud. In either form the hydrogen fluoride would tend to be adsorbed into any water source with which it came in contact as the cloud dispersed. Under normal circumstances the cloud would be highly dispersed before coming into contact with the ground and as such deposition of hydrogen fluoride in any given area would be extremely low and would have minimal impact on surface water pH levels.

As an example, we assume the maximum instantaneous airborne concentration noted above (6.27 milligrams per cubic meter) is deposited on a 1-meter square area of water with a pH of 7 and an alkalinity of 25 milligrams per liter (calcium oxide equivalent). Further assuming the deposited hydrogen fluoride reacted with only the first 3 inches of water, the total volume of water in the reaction would be 75 liters (20 gallons). The total available alkalinity would be approximately 1,890 milligrams calcium oxide, only 3.15 milligrams of which would be required to neutralize the 6.27 milligrams of hydrogen fluoride deposited in this example. Therefore, there would be negligible loss of alkalinity. The overall pH of the system would also not be subject to change.

In systems with low mixing dynamics (slow current or no flow) it is possible that a thin acid layer would temporarily form over a more basic layer. If it occurred, this layering effect would be transitory and would be lessened by water flow or animal movements in the water.

Under rainy conditions, it is possible that the exhaust could be deposited in a smaller area, resulting in a greater amount of hydrogen fluoride in any given area. However, rain levels sufficient to wash the hydrogen fluoride from the exhaust cloud would also serve to dilute the acid and mitigate its impact on surface waters. Wind levels during such rain events would also serve to disperse the hydrogen fluoride even as the rain serves to concentrate it. The base pH of the rain would further serve to buffer any system to which the

hydrogen fluoride is introduced. Rain has a pH range of approximately 4-8 under normal circumstances and the addition of the small amount of hydrogen fluoride would not be likely to cause a significant change in the pH of the rainfall. As such, hydrogen fluoride that is adsorbed into rain would not be likely to have a measurable impact.

4.4.3.2 Cumulative Impacts

Cumulative impacts would be similar to those discussed in section 4.1.3.2.

4.4.4 SSC CULTURAL RESOURCES

4.4.4.1 Environmental Effects

Prehistoric and Historic Archaeological Resources

Prehistoric and historic archaeological surveys of the SSC Fee Area, including the area of the MSAAP and the LTF project area are considered complete by the Mississippi SHPO (National Aeronautics and Space Administration, 1995b; Mississippi Department of Archives and History, 1990) and no further studies are required. Except for archaeological sites and artifacts located in the areas of the Gainesville and Logtown townsites (outside the ROI for LTF), there are no sites within the Fee Area or the ROI. Because archaeological sites and artifacts are known to occur within the boundary of the installation, there is some potential for cultural materials to be unexpectedly discovered during the course of project activities. In the event this should occur, all activities would halt in the immediate area and the Mississippi SHPO consulted through the SSC Environmental Office. Subsequent actions would follow guidance provided in 36 CFR 800.11 and/or in NAGPRA.

The MSAAP obtained approval of a variance not to prepare an Integrated Cultural Resources Management Plan (U.S. Department of the Army, 1999). To ensure that historic resources are appropriately considered during construction planning, a Preliminary Environmental Study form has been developed that must be completed by any proponent of an activity at SSC. The form must be submitted to the Environmental Office for consideration before any construction. In addition, all construction contracts will contain language requiring notification to the Contracting Officer of any archaeological finds discovered during construction. Therefore, there would be no effect on cultural resources from activities associated with construction of the LTF facilities.

Historic Buildings and Structures

There are no National Register-listed or eligible buildings within the ROI for the LTF program; therefore, there would be no effects on historic properties.

Native Populations/Traditional Resources

There are no traditional cultural properties within the ROI for LTF activities; therefore, no effects are expected.

4.4.4.2 Cumulative Impacts

There are no past, present, or reasonably foreseeable future programs identified within the ROI for the LTF program; therefore, no cultural resources cumulative impacts would be expected to occur.

4.4.5 SSC GEOLOGY AND SOILS

The construction and operational impacts associated with the proposed project at SSC would be similar to those discussed for the Cape Canaveral AS alternative location (see section 4.1.5).

4.4.5.1 Environmental Effects

Construction

Construction of the LTF at SSC would result in the disturbance of more than 2 hectares (5 acres) of land and, therefore, would be subject to NPDES construction permit requirements. Compliance with the NPDES SWPPP would minimize soil erosion and pollutant discharges during construction. In addition, compliance with the SPCC Plan would minimize the potential for accidental spills of hazardous chemicals to affect project soils. As a result, construction-related impacts to geology and soils are considered minor.

Operation

Soils in the area of LTF operations are moderately to strongly acidic (average pH levels range from approximately 4.5 to 5.5) (Iowa State University Statistical Laboratory, 1998). Due to the low buffering capacity of the soils, the deposition of small amounts of hydrogen fluoride may result in a slight and temporary increase in soil acidity. However, because hydrogen fluoride deposition on soil surfaces would occur only during periods of high humidity and because hydrogen fluoride is highly soluble in water, small amounts of hydrogen fluoride residuals would be quickly diluted and buffered by rainfall. LTF operations are not expected to result in long-term changes in the chemical composition or physical characteristics of soils located within the project's ROI. However, temporary increases in soil acidity may result in short-term impacts to vegetation and soil-dwelling microorganisms.

Compliance with the NPDES SWPPP would minimize soil erosion and pollutant discharges during project operations. Compliance with the SPCC Plan would minimize the potential for accidental spills of hazardous chemicals to affect project soils. Operational activities are not expected to result in long-term changes in the chemical composition of soils located within the project's ROI.

Because SSC is located in a low seismic risk area, the potential occurrence of liquefaction, seismic settlement, or ground rupture at the project sites are considered minimal. In addition, soils at the LTF sites exhibit low shrink/swell susceptibility. Potential

geotechnical problems associated with the construction of the LTF at SSC are considered minor.

4.4.5.2 Cumulative Impacts

Temporary, minor impacts to geology and soils, when combined with other current and foreseeable future activities, would not result in cumulative impacts.

4.4.6 SSC HAZARDOUS MATERIALS AND HAZARDOUS WASTE MANAGEMENT

For a discussion and description of the hazardous materials and hazardous wastes associated with LTF, see section 4.1.6.

4.4.6.1 Environmental Effects

Construction of LTF at SSC would use small amounts of hazardous materials and hazardous wastes, primarily paints, oils, and solvents. These materials would be containerized and properly disposed of by the individual contractor.

The operation and maintenance of LTF at SSC would increase the amounts of hazardous materials used and hazardous wastes generated at the facility. These hazardous materials and hazardous wastes listed in table 2-6 include paints, solvents, acids, bases, ethylene glycol, and alcohol, as well as hydrogen fluoride- and sodium fluoride-contaminated wastes. RCRA requires that as a generator of hazardous materials, the LTF facility would be required to acquire a U.S. EPA identification number. All waste generated by the LTF would be stored, transported, and disposed of under this number. Any waste stored onsite more that 90 days would require a RCRA permit. While procedures are in place to manage certain hazardous materials and wastes in small quantities, the fuel and exhaust constituents as well as the corrosive and caustic hazardous wastes would be new elements to SSC/MSAAP as they currently operate. These quantities and categories of waste would increase the potential for adverse environmental effects from hazardous material and waste storage, transportation, and disposal.

MSAAP would reinstate procedures and programs to manage the hazardous materials and hazardous wastes associated with LTF in accordance the applicable laws, regulations, and DOD policies. Personnel, programs, and facilities would be prepared to manage the additional hazardous materials and hazardous wastes. DOD policies are in place to direct these efforts and minimize the potential for environmental impacts. In addition, pollution prevention efforts would apply to LTF activities.

4.4.6.2 Cumulative Impacts

The additional quantities of hazardous materials and subsequent hazardous wastes would cause MSAAP to become a Large Quantity Generator of hazardous waste. Since the MSAAP generated large quantities of hazardous wastes when it was in operation, facilities

and disposal contract capabilities are available to meet the hazardous waste management needs of LTF. However, the current regulatory requirements for permits, filings, and risk management planning would substantially increase. Additional training and management would be required.

4.4.7 SSC HEALTH AND SAFETY

4.4.7.1 Environmental Effects

Construction Activities

Few existing structures would be used at SSC. Preparation for new construction includes clearance of existing vegetation, grading, and excavation for foundations. An area would be prepared for construction equipment laydown, personal vehicle parking, temporary mobile offices (trailers), maintenance facilities, and other construction needs. Concrete for foundations and footings and other construction materials would be delivered by truck in accordance with DOT and NASA regulations. The tall structures of the proposed construction would present a fall hazard to workers. Construction activities would be conducted in accordance with OSHA, NASA, and USACE requirements for health and safety to control exposure to occupational safety and health hazards.

Operations—General

See section 4.1.7.1 for a description of environmental effects of LTF operations.

Operations—SSC

Activation of the 550-meter (1,800-foot) inhabited building ESQD or the 1.2-kilometer (0.75-mile) Laser Safety Zone would impact travel on the roads in the vicinity of the LTF. Travel on these roads would be suspended while either the ESQD or the Laser Safety Zone is active. The ESQD would be active for fueling. The Laser Safety Zone would be active for 2 hours, 16 times per year.

The dispersion of the exhaust emission from the PRS would be modeled for meteorological conditions before each test. When modeling indicates the concentration of hydrogen fluoride would exceed the exposure criterion of 3 ppm at the boundary of the exclusion zone, the test would be delayed until more favorable meteorological conditions prevail.

Facility and equipment designs would incorporate measures to minimize the potential for and impact of accidental releases. Operating procedures and training would be instituted to minimize the potential for and impact of releases of hazardous materials. Appropriate emergency response plans would be established and implemented to deal with potential chemical releases.

4.4.7.2 Cumulative Impacts

All work on the Proposed Action would be performed in accordance with applicable health and safety regulations. No injuries or illnesses are anticipated. No other activities have been identified within the ROI that when combined with the Proposed Action would have a cumulative impact on health and safety.

4.4.8 SSC LAND USE AND AESTHETICS

4.4.8.1 Environmental Effects

Regional Land Use

The proposed LTF would be located in the MSAAP area of SSC, which is in the northern half of the Fee Area of SSC. The entire Fee Area is surrounded by a 10-kilometer (6-mile) wide buffer zone, in which there can be no habitable structures. Therefore, construction and operational activities would not affect the adjacent offsite land uses. No noise related impacts on adjacent land use are anticipated because noise should be below background noise levels at the 1.2-kilometer (0.75-mile) Laser Safety Zone radius. See the Chapter 4 sections on noise for additional information.

On-base Land Use

New construction and operational activities would occur within the MSAAP, which is characterized by its industrial-type function. The PTC Complex would require approximately 6 hectares (15 acres), and the I&T Complex would need approximately 10 hectares (25 acres). Up to 20 hectares (50 acres) could be disturbed during the construction phase, which includes a 4-hectare (10-acre) construction laydown area along the road to the PTC Complex. The PTC Complex, I&T Complex, and site operations (including the inhabited building ESQD and the Laser Safety Zone) would be compatible with the industrial nature of the MSAAP. However, there are weapons storage igloos and an adjacent building in the 9600 area, and a small building in the north central section of MSAAP in the 9138 area that are currently being used for private commercial operation. These structures are located within the Laser Safety Zone required around the test facility and are considered an incompatible land use. All of these operations are temporary and are easily postponed or rescheduled. The proposed facilities and operations would not result in a conversion of prime agricultural land or cause a significant decrease in the utilization of the land.

Aesthetics

New construction could slightly alter the view surrounding SSC. Several of the proposed facilities would be approximately 61 meters (200 feet) tall, which is not out of character with other structures at SSC that are up to 90 meters (295 feet) tall. The Buffer Zone, the flatness of the land, and the presence of pine plantations substantially decrease the viewpoints of SSC from outside the base. Views are primarily limited to adjacent landowners to the north and to visitors of the Visitor's Center. The construction and

operation of LTF would not affect the area's aesthetic quality nor would it obstruct any prominent or scenic views.

4.4.8.2 Cumulative Impacts

In terms of potential for cumulative impacts, the proposed site for the PTC Complex is currently open land, used for the cultivation and harvesting of timber and other agricultural activities. The proposed area for the I&T Complex is an undeveloped area just north of the old Army Ammunitions Plant. All of this area prior to the uses by the Army, consisted of mostly cultivation and harvesting of timber and other agricultural activities. The proposed PTC and I&T Complexes would affect less than 1 percent of the land at SSC and would not create a cumulative change. The Laser Safety Zone around the facility could affect the current commercial use of some facilities. These operations could be relocated or arrangements made to postpone or reschedule operations at these facilities during times of testing. This Laser Safety Zone would have no other impacts on the land use. The proposed LTF program would not contribute to any cumulative land use impacts.

4.4.9 SSC NOISE

A general discussion of noise is given in section 4.1.9.

4.4.9.1 Environmental Effects

Potential impacts from LTF program activities could come from noise generated by construction equipment during construction activities and from noise generated by the PRS during operational activities.

Construction

At a distance of approximately 15 meters (50 feet), the noise from typical construction equipment falls in the range of 70 dBA to 100 dBA (with peak noise from pile drivers going as high as 110 dBA) (U.S. Environmental Protection Agency, 1971). As such, under most meteorological conditions, all construction noise would be anticipated to attenuate to 85 dBA at a radius of approximately 270 meters (890 feet) from the construction site. As no point on the SSC facility boundary is anticipated to be closer than this, then no noise impacts to the public from construction noise would be anticipated.

Operation

While it is operating, the PRS is anticipate to generate a noise level of approximately 125 dB at a distance of 15 meters (50 feet) from the end of the PRS ejectors. Assuming no attenuation due to intervening structures or vegetation, the noise from such a source would attenuate to approximately 85 dB at a radius of approximately 1.0 kilometers (0.64 miles). As this would be within the 1.2-kilometer (0.75-mile) Laser Safety Zone, no impacts to the noise environment would be anticipated from the operation of the PRS.

This is especially true because operation of the PRS would be a few minutes duration approximately 16 times per year.

The PRS would be built such that the ends of the ejectors are not aligned in the direction of known noise sensitive receptors. Noise barriers, such as walls or groups of trees, could also be placed between the ends of the PRS ejectors and noise sensitive receptors to further reduce the potential for impacts.

4.4.9.2 Cumulative Impacts

Noise impacts for SSC would include those from current programs and those expected from LTF activities. Most of these noises are intermittent and are not expected to cumulatively impact the area.

4.4.10 SSC SOCIOECONOMICS

4.4.10.1 Environmental Effects

The Proposed Action would comprise two components or phases: the construction phase and the operational phase.

Construction

The Proposed Action at SSC would start with a construction phase of new and refurbished facilities. The construction program would be expected to draw on local resources including labor and material. It is estimated that the total construction cost of the buildings required at SSC, including labor and materials, would be $93.49 million.

The construction phase would generate 1,164 full-time equivalent construction jobs that would create $28.74 million in wage income. This wage income would translate into personal consumption expenditure within the ROI of $23.26 million. In addition, the construction program would require the purchase of raw materials and finished building products. It is estimated that these purchases would equal about $39.26 million.

These jobs and expenditures would be substantial, yet transitory, benefits for the local economy. The result of the construction program, however, would be an operational facility that would generate recurring economic benefits.

The construction phase, because it would be carried out a substantial distance from inhabited areas, would not be expected to affect the quality of life of local residents or visitors to the region.

Operation

The operational parameters of the Proposed Action would be identical to those outlined at Cape Canaveral. A total of 350 jobs and $7.47 million of annual household income would be created directly by the first phase of the action and indirectly in the local economy via the multiplier effect.

The second phase of the Proposed Action would require 170 personnel. If these jobs were new to the local economy, they would generate $5.26 million of direct consumption expenditure, 654 direct and indirect jobs, and $13.94 million of direct and indirect annual household income.

The creation of these new jobs could have the potential to increase demand for new homes and local services, including health, education, and other publicly-provided facilities. If every job created by the Proposed Action brought with it a typical U.S. household (2.64 persons in 1997), then 91 first phase jobs would bring 240 people, and 170 second phase jobs, 449. If all of those moving into the area came from outside of the regional economy, then the population of the region would increase by a maximum of slightly more than 0.1 percent. The current forecast increase in population between 1997 and 2005 (based on existing demographic trends) is about 61,100. The potential increase in population attributed to this action would, therefore, require an increase of the forecast by less than 1 percent.

Operational impacts on the quality of life would be minimal due to the relative isolation of the testing site at SSC and the non-invasive character of the Proposed Action.

Cumulative Impacts

The local and regional growth forecasts imply that the additional jobs created in the community would not add significantly to the existing trends.

The positive monetary impacts of the Proposed Action would help sustain current economic growth plans and forecasts for the region.

4.4.11 SSC TRANSPORTATION

4.4.11.1 Environmental Effects

Roadways

The MSAAP area is well served with an excellent network of roadways, waterways, railways, and airways. During peak travel periods, traffic along Balch Boulevard interferes somewhat with vehicles entering or leaving the Test Area and Engineering and Administration Area (National Aeronautics and Space Administration, 1997c). However, roadways leading to the proposed PTC Complex (east of the Andrew Jackson-Flat Top roads intersection) and I&T Complex (north of the junction of Flat Top and Moses Cook roads) have no peak traffic times or congestion problems (Stennis Space Center, 1998).

As no new transportation-related construction is anticipated, no impacts are expected from such activities. The existing infrastructure, such as roads and bridges, should be adequate to handle the transportation of necessary test items.

During the LTF construction phase, there would be approximately 800 vehicle trips per day for the first 6 months, and 10 truck trips per day, with a peak of 50 truck trips per day. Operations traffic would generate approximately 240 vehicle trips per day and 1 truck trip per day. These traffic volumes would be less than the previous volumes when the MSAAP staff levels were approximately 3,000 people. Mississippi Department of Transportation capacity analysis showed that SH-607 is currently operating at level of service A. The project-related traffic would have no noticeable impact on the level of service for SH-607. (Balentine, 1999)

Transportation of hazardous materials would be accomplished in accordance with DOT regulations for interstate shipment of hazardous substances.

Waterways

Potential LTF barge activities are similar to current activities for SSC. Barge transport of the RD vehicle at the conclusion of the test program could be accommodated with no impact. The distance from the proposed LTF sites to the barge dock is approximately 6.9 kilometers (4.3 miles). Access to the Intracoastal Waterway is unconstrained, and the deep-water port of Gulfport is available as necessary.

Railways

The MSAAP railroad system is utilized for certain shipments needed by NASA and could accommodate shipping and receiving of LTF-related components up to three times per year. Refurbishment could be required, but only if more than occasional railway use were deemed necessary (Operation Enterprise, 1996).

Airways

Project requirements for occasional shipping and receiving of LTF-related components approximately three times per year would not impact airway traffic at either Stennis International or Gulfport-Biloxi Regional airports.

4.4.11.2 Cumulative Impacts

No transportation impacts are expected outside of SSC boundaries. Roadways used to travel to and from proposed LTF sites have sufficient carrying capacity to handle the increase in traffic. No other programs have been identified that, when combined with LTF-related transportation impacts, would contribute to cumulative impacts to transportation. As such, cumulative impacts are expected to be non-existent or minimal, with no anticipated degradation of transportation quality of increase in travel time.

4.4.12 SSC UTILITIES

4.4.12.1 Environmental Effects

Water Supply

Water required for LTF construction (table 2-3) would be 7.3 percent of the current MSAAP average daily use. Combining MSAAP usage and LTF usage would result in a total usage of 6 percent of the available water supply.

Monthly water requirements for LTF operations (listed in table 2-4) would be 6.3 percent of current capacity, and when combined with the current MSAAP usage would result in a total usage of 6.3 percent of the available water supply.

Due to increased personnel and activity levels, annual water usage would increase, but would not overload the SSC capacity. Current sources of water are sufficient to meet demands of the proposed project. Water supply would require a 2,286-meter (7,500-foot) connection to the 40.6-centimeter (16.0-inch) water main near the storage tank at the Andrew Jackson-Leonard Kimble road intersection.

Wastewater

Wastewater treatment facilities are currently operating at less than capacity, and additional wastewater generated as a result of personnel increases and project activities at SSC would be negligible.

Domestic sewage treatment is available at the MSAAP site via an onsite extended aeration system at a capacity of 567,812 liters (150,000 gallons) per day. Industrial waste treatment also is available at 757,080 liters (200,000 gallons) per day via an onsite, heavy metals removal system. (Operation Enterprise, 1996)

During LTF construction, a temporary concrete batch plant would be erected at the site, and water from the plant would be captured and collected in a retainment or detainment pond (depending upon site requirements). Wastewater would be treated and disposed of in accordance with existing permit limitations.

Estimated wastewater levels from LTF construction activities are listed in table 2-4. The maximum annual demand would be less than 0.13 percent of MSAAP's onsite domestic sewage treatment capacity and a fraction of the installation's overall capacity. At its peak, LTF wastewater demand during construction would result in a total demand of 23.5 percent of available capacity.

Based on a 250-workday year, annual wastewater demands (table 2-4) during LTF operation would be 9.9 percent of current use and would result in a total demand of 25.6 percent of available capacity.

The WWTP has an 1,800-person capacity; the addition of 800 employees would not be near the design threshold (EDAW, Inc., 1998b). Though the MSAAP WWTP has the capacity to handle the anticipated LTF requirements, it would require a connection to the 20.3-centimeter (8-inch) sanitary sewer main near the WWTPs at the intersection of Andrew Jackson and Leonard Kimble roads, approximately 2,290 meters (7,500 feet) away.

Solid Waste

Solid waste disposal is handled offsite, 48 kilometers (30 miles) from MSAAP (Operation Enterprise, 1996) at the Pecan Grove Landfill.

Various types of solid waste/construction debris would be generated during LTF construction; it is estimated that between 91 and 136 metric tons (100 and 150 tons) per month of solid waste would be produced during peak construction activity. This would be 0.38 percent of Pecan Grove's current level of approximately 36,287 metric tons (40,000 tons) per month (or 1.8 million kilograms [2,000 tons] per day x 20 working days) and an increase of 7.5 percent over the MSAAP's current levels.

Where practicable, this waste would be recycled. Removal of wastes and construction debris would be handled by the construction contractor; unused cut and fill material would be transported from the project area to an approved spoil site. Construction impacts on solid waste generation and disposal would be minor. Solid waste generation would not substantially increase the volume of waste generated by SSC.

LTF operations would generate 45.4 metric tons (50 tons) of solid waste per month, 0.08 percent of the current waste flow.

Additional demands on SSC solid waste disposal resulting from proposed project demands and personnel increases would be negligible.

Energy

Electric capacity for the MSAAP site is 2,000 kVA, at a voltage of 480 (Operation Enterprise, 1996). The utility transmission voltage at the MSAAP and the proposed LTF site is 13.8 kV, the same as the base transmission voltage. Power available for the LTF site can be provided by tapping the overhead feeders and extending the lines, 0.8 kilometer (0.5 mile) overhead and 1.2 kilometers (0.75 mile) underground, to the site.

The maximum capability of the MSAAP is approximately 21,280,000 kWh per month. Figures for July 1999 indicate the peak monthly usage for MSAAP is approximately 1,255,000 kWh; this amounts to 5.9 percent of total capacity. (Havard, 1999) The monthly demand for the LTF operational phase is 250,000 kWh, an increase of less than 20 percent of current demand and less than 1.2 percent of the capacity of the system.

Additional demands on the SSC electrical systems by the Proposed Action would be insufficient to cause detrimental infrastructure impacts, and would be negligible.

LTF requirements of 637 cubic meters (22,250 cubic feet) per hour peak usage of natural gas could easily be met, provided a connection is made to the line running parallel to Andrew Jackson Road 731 meters (2,400 feet) away. The current usage level of 600 therms per month would effectively double (1,600 therms per month), but would be less than 12 percent of the current capacity per hour. This demand would have no impact (Ham, 1999).

4.4.12.2 Cumulative Impacts

Proposed project activities would have minimal to no impacts outside of SSC. The utility systems at SSC are under-utilized and are typically operating at less than 20-percent capacity, with no restrictions on their availability; utility backups and portable generators are available in the event of emergencies (Stennis Space Center, 1998). No other programs have been identified that, when combined with the LTF requirements, would result in cumulative impacts.

4.4.13 SSC WATER RESOURCES

Surface and groundwater impacts associated with LTF construction and operational phases at SSC are similar to those discussed for the Cape Canaveral AS alternative location (see section 4.1.13).

4.4.13.1 Environmental Effects

Construction

Construction of the LTF at SSC would result in the disturbance of more than 2 hectares (5 acres) of land and, therefore, would be subject to NPDES construction permit requirements. Construction-related earthwork would follow guidelines of the appropriate SWPPP. It is anticipated that existing permits will cover construction activities. Storm water levels will necessitate a retention pond, with water treatment carried out per applicable local regulations. Any onsite demolition will require additional consideration to account for the possibility of special treatment requirements for existing materials, such as lead-based paint or asbestos. Compliance with the NPDES SWPPP would minimize soil erosion and pollutant discharges during construction. In addition, compliance with the SPCC would minimize the potential for accidental spills of hazardous chemicals to affect surface and groundwater resources. As a result, construction-related impacts to water resources are considered minor.

Operation

Surface waters in the vicinity of SSC are slightly acidic to alkaline in nature. Average surface water pH levels range from a low of 6.1 in nearby freshwater streams to a high of nearly 8.0 in the access canal (National Aeronautics and Space Administration, 1990; John C. Stennis Space Center, 1992). Because emissions of hydrogen fluoride are expected to be minor and intermittent in nature, only slight and temporary reductions in the pH values of surface waters are expected. Small amounts of hydrogen fluoride deposited on surface waters would quickly dissipate due to surface water mixing and the natural buffering capacity of the surface waters.

The risk of accidental releases of hazardous materials or wastes is considered minimal. All activities conducted on the project site would be required to comply with the SPCC Plan, to be developed and implemented as part of this project. Compliance with the SPCC Plan would minimize the potential for accidental spills of hazardous chemicals to affect surface and groundwater resources.

Operations at SSC, including the proposed LTF site, are required to comply with NPDES industrial permit requirements. Treated storm water is currently discharged to local water courses in compliance with a NPDES industrial permit administered by the Mississippi Department of Environmental Quality. Any change in design, construction, operation, or maintenance of facilities that result in an increase of pollutant discharge to State waters, would require application for a NPDES permit (or amendment of an existing applicable permit) and potential revisions to the SWPPP. The Proposed Action would require an amendment of the existing NPDES industrial permit for inclusion of wastewater discharges associated with the operation of the proposed facilities. LTF operations could affect the NPDES permit for the industrial WWTP and the MSAAP storm water permit; however, the permits could be modified accordingly. Compliance with NPDES requirements and the SWPPP would minimize pollutant discharges during project operations.

EO 11988 directs Federal agencies to "avoid the extent possible the long- and short-term adverse impacts associated with occupancy and modification of floodplains." Areas proposed for LTF activities are not located within a 100-year floodplain. As a result, risk of flooding at the project site is considered minor.

4.4.13.2 Cumulative Impacts

No other activities that would impact water resources have been identified at the proposed LTF locations. No future programs have been identified that when combined with the Proposed Action would contribute to cumulative water resources impacts.

4.4.14 SSC ENVIRONMENTAL JUSTICE

4.4.14.1 Environmental Effects

EO 12898 requires that Federal agencies identify and address disproportionately high and adverse environmental effects (including human, health, and economic and social effects) of its programs, policies, and activities on minority and low-income populations. An environmental justice impact would be a long-term health, environmental, cultural, or economic effect that has a disproportionately high and adverse effect on a nearby minority or low-income population, rather than all nearby residents. The potential for a disproportionately high and adverse effect could occur under either of two conditions: (1) the percentage of persons in low-income or minority populations in the census tracts exceeds the percentage in the county, the region of comparison, or (2) the percentage of low-income or minority population in the census area exceeds 50 percent.

Construction and operation of the LTF at SSC would not disproportionately affect any minority or low-income populations. The potential environmental or human health impacts noted above would be contained within the SSC boundary and would not impact any populated areas. No Native American or traditional cultural resources would be impacted from LTF construction and operation.

4.4.14.2 Cumulative Impacts

No other projects or activities in the region along with LTF have been identified that would contribute to potential cumulative environmental justice impacts.

4.5 ENVIRONMENTAL EFFECTS OF THE NO-ACTION ALTERNATIVE

The No-action Alternative assumes continued use of these sites at their current operational levels as defined in section 2.4.

Air Quality

Continuing and planned levels of activities at the proposed LTF areas would have negligible effects on air quality.

Airspace

Continuing and planned levels of activities would use the existing airspace and special use airspace. No impacts to the surrounding low altitude airways, high altitude jet routes, or the existing public use airfields and airports would occur from the No-action Alternative.

Biological Resources

Continuing and planned levels of activities at the proposed LTF areas would have negligible effects on local vegetation, wildlife, or habitats. Threatened and endangered species and wetland areas would continue to be protected by natural resource management practices.

Cultural Resources

Continuing and planned levels of activities at the proposed LTF areas would have negligible effects on potentially eligible NRHP sites. Natural processes would continue to affect existing cultural resources.

Geology and Soils

Continuing and planned levels of activities at the proposed LTF areas would have little effect on geological and soil resources.

Hazardous Materials and Hazardous Waste Management

Continuing and planned levels of activities at the proposed LTF areas would use and generate minimal quantities of hazardous materials and wastes.

Health and Safety

Continuing and planned levels of activities at the proposed LTF areas would have little effect on occupational or public exposure to safety or health hazards.

Land Use and Aesthetics

Continuing and planned levels of activities at the proposed LTF areas would not impact land use. Future land use is expected to remain compatible with the current uses. Aesthetic quality would not be affected by the No-action Alternative.

Noise

Continuing and planned levels of activities at the proposed LTF areas would not change the noise environment, which would include minimal noise from road traffic.

Socioeconomics

Continuing and planned levels of activities at the proposed LTF areas would result in no changes to minor changes in local or regional socioeconomic trends.

Transportation

Continuing and planned levels of activities at the proposed LTF areas would have little effect on land, water, rail, or air transportation. The current transportation patterns and growth would continue.

Utilities

Continuing and planned levels of activities at the proposed LTF areas would result in maintaining the existing level of potable water consumption, wastewater treatment demand, municipal solid waste, and energy demand.

Methods used for the disposal of treated wastewater will be governed by Federal, state, and local laws pertaining to the amounts of wastewater and the capacity of treatment plants.

Water Resources

Continuing and planned levels of activities at the proposed LTF areas would result in negligible effects on surface and groundwater resources.

Environmental Justice

Continuing and planned levels of activities at the proposed LTF areas would not result in environmental justice impacts.

4.6 ADVERSE ENVIRONMENTAL EFFECTS THAT CANNOT BE AVOIDED

Adverse environmental effects that cannot be avoided include the release of small amounts of pollutants into the atmosphere; minor noise impacts on wildlife; slight disturbance of vegetation; minor increase in erosion of soils; minor increased generation of hazardous materials; and increased noise levels at LTF-related sites. However, through implementation of the program actions described within this document, these effects would be minimized.

4.7 RELATIONSHIP BETWEEN SHORT-TERM USES OF THE HUMAN ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Although proposed LTF activities would require major construction, the activities would be consistent with the installation's land use. Therefore, the Proposed Action would eliminate options for future use of the environment for the specific PTC and I&T Complex construction locations under consideration. The total acreage involved would be approximately 16 hectares (40 acres).

4.8 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

The Proposed Action would result in a minor loss of habitat for plants or animals, no anticipated loss of threatened or endangered species, and no loss of cultural resources, such as archaeological or historic sites. Moreover, there would be no changes in land use nor preclusion of development of underground mineral resources that were not already precluded.

The amount of materials and energy required for any program-related activities would be small. Although the proposed activities would result in some irreversible and irretrievable commitment of resources such as various metallic materials, minerals, and labor, this commitment of resources is not significantly different from that necessary for many other defense research and development programs. It is similar to the activities that have been carried out in previous defense programs over the past several years.

4.9 COMPATIBILITY WITH FEDERAL, REGIONAL, STATE, LOCAL, OR NATIVE AMERICAN LAND-USE PLANS, POLICIES, AND CONTROLS

Land-use planning would follow Installation Master Plans; the requirements of Section III (Chapter 2) of AR 200-1, *Environmental Protection and Enhancement*; and applicable NASA requirements. In addition, LTF activities would comply with applicable Federal, state, and local laws and regulations. Additional consultation would be required with KSC, Cape Canaveral, and MINWR to ensure compatibility with their land management practices.

Proposed activities occurring at existing manufacturing sites would have no impact on land use itself and present no conflicts with Federal, regional, state, local, or American Indian land-use plans, policies, or controls.

Any potential conflicts with land-use plans, policies, or controls would be a primary focus of agreements that would be negotiated with all affected Federal, regional, state, local, and American Indian agencies before implementation of the Proposed Action.

4.10 ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL

Anticipated energy requirements of program activities can be accommodated within the energy supply of the region of each alternative. Energy requirements would be subject to any established energy conservation practices.

4.11 NATURAL OR DEPLETABLE RESOURCE REQUIREMENTS AND CONSERVATION POTENTIAL

Other than the use of various structural materials and fuels, no significant use of natural or depletable resources would be required for LTF activities.

5.0 References

5.0 REFERENCES

Agency for Toxic Substances and Disease Registry. 1998. Frequently Asked Questions: Fluorides, Hydrogen Fluoride, and Fluorine [Online. Available: http://atsdr1.atsdr.cdc.gov: 8080/ToxFAQs/007664-39-3.html [30 July].

Alabama Department of Environmental Management, 1997. "Army Seeks Change in Permit for RSA Landfill," *ADEM Home Page,* [Online]. Available: www.adem.state.al.us/8armyse.html, [14 August].

Alabama Natural Heritage Program, 1995. List of federally designated or state-protected species with the potential to occur at Redstone Arsenal from the Redstone Arsenal Final Report.

Albury, J., 1998. Personal communication between Joan Allbury, 45 CES/CEV, and Brenda Brickhouse, EDAW, Inc., concerning hazardous waste generation on Cape Canaveral AS, 11 March.

American Industrial Hygiene Association, 1988. *Emergency Response Planning Guidelines, Hydrogen Fluoride*, October.

American Institute of Aeronautics and Astronautics, 1993. *Environmental Monitoring of Space Shuttle Launches at Kennedy Space Center: the First Ten Years.*

American National Standards Institute, Inc., 1993. ANSI Z136.1-1993, *American National Standard for the Safe Use of Lasers*, The Laser Institute of America, June.

Anderson, D.E., O.J. Rongstad, and W.R. Mutton, 1986. "The Behavioral Response of a Red-tailed Hawk to Military Training Activity," *Raptor Res.* 20:65-68.

Ballistic Missile Defense Organization, 1997. *Space Based Laser Test Facility (STF), Facility Requirements Document, MCR-97-570*, 17 January.

Ballistic Missile Defense Organization, 1998a. Ballistic Missile Defense Organization Directive 6050, *Environmental Safety and Health Program Management for BMDO Acquisition Activities.*

Ballistic Missile Defense Organization, 1998b. LTF Data Needs Table received from the Ballistic Missile Defense Organization, July.

Barr, L., 1998. Personal communication between Lisa Barr, Special Projects Coordinator, Brevard County Solid Waste Management Department, and James E. Zielinski, EDAW, Inc., concerning county landfills, 24 February.

Bartosek, T., 1998. Personal communication between Tom Bartosek, Staff Specialist II, Florida's Space Coast Office of Tourism, and James E. Zielinski, EDAW, Inc., concerning Brevard County maps and transportation information, 18 February.

BDM Management Services, 1986. *PRS Noise Level Measurements for SLBD Work Areas of TC-1*, March.

Bolton, J., 1998. Personal communication between John Bolton, Plant Operator, South Memorial Parkway Water Treatment Plant, Huntsville Utilities, and James E. Zielinski, EDAW, Inc., concerning water supply and services for Madison County, Alabama, area, 23 February.

Boyett, G., 1998. Personal communication between Greg Boyett, CAD Administrator, City of Huntsville Natural Gas, and James E. Zielinski, EDAW, Inc., regarding proposed increases to natural gas availability and capacity, 24 January.

Burroughs, M., 1998. Personal communication between Mark Burroughs, General Engineer, Redstone Arsenal Public Works, and James E. Zielinski, EDAW, Inc., concerning transportation and utilities on the Arsenal, 25 March.

Busacca, M, 1997. Personal communication between Mario Busacca, Chief of Planning and Special Projects Group, KSC Environmental Program Office, Kennedy Space Center, and Paige Peyton, Earth Tech, Inc., regarding the status of archaeological and historical resources at the Kennedy Space Center, 3 March.

Cain, C.W., 1998. Personal communication between C.W. Cain, Major Accounts Manager, Florida Power and Light Company, and James E. Zielinski, EDAW, Inc., concerning existing and future capabilities of electrical distribution substations in Brevard County and 1996 FPL Group Annual Report, 24 February.

Canaveral Port Authority, 1997. *Port Canaveral Homepage*, [online]. Available: http://www.portcanaveral.org, [March].

Cape Canaveral Air Force Station, 1992. *Interim Base Comprehensive Plan, Cape Canaveral Air Force Station, Land Use - Existing and Proposed - Section 1*, 30 September.

Cape Canaveral Air Station 45th Space Wing, 1996. *Cape Canaveral Air Station, Florida, General Plan/Comprehensive Plan,* 1996.

City of Cocoa, 1998. Utilities and Public Works, [Online]. Available: http://www.cocoafl.org/utilities.html, [17 February].

City of Huntsville, 1997. *Traffic Count Map, City of Huntsville, Alabama, 1997 Traffic Volume Counts,* October.

City of Melbourne, 1998. Official web site of the City of Melbourne, Florida, [online]. Available: http://www.iu.net/melbourne/city, [no date].

City of Palm Bay, 1996. "Palm Bay Utilities Department," *Palm Bay Government*, [online]. Available: http://www.iu.net/palmbay/utility.html, [no date].

Clark, G., 1997. Personal communication between George Clark, Commercial and Industrial Coordinator, Huntsville Utilities, Alabama, and Calvin Chow, EDAW, Inc., regarding potable water, electricity, and natural gas use in Madison County, 11 June.

Coast Electric Power Association, 1998. "Coast Electric Power Association services region's industrial parks," *CEPA Home Page,* [Online]. Available: http://www.coastepa.com/industrialparks.html, [no date].

Coker, E., 1997. Personal communication between Eddie Coker, Executive Director, Solid Waste Authority City of Huntsville, Alabama, and Calvin Chow, EDAW, Inc., regarding solid waste disposal in Madison County, 11 June.

Collier, M., 1998. Personal communication between Marlin D. Collier, State Planning Engineer, and James E. Zielinski, EDAW, Inc., concerning Hancock County Traffic Counts, includes tables, 25 March.

Compass North American, Inc., 1998. "Port of Gulfport, MS - A Seaports InfoPages 'Mini-Profile!'," *Seaports of the Americas Home Page*, [Online]. Available: http://www.seaportsinfo.com/gulfport.html, [no date].

Cooksey, C., 1999. Personal communication between Chuck Cooksey, Air Traffic Controller, Space Gateway Support, Skid Strip Operations, Patrick AFB, and James E. Zielinski, EDAW, Inc., concerning statistics for Skid Strip operations and capacity, 24 May.

Cowan, J., 1994. *Handbook of Environmental Acoustics*. Van Nostrand Reinhold: New York.

Crouch, M., 1998. Personal communication between Micki Crouch, Customer Services Manager, Cocoa Utilities, and James E. Zielinski, EDAW, Inc., concerning Cape Canaveral and Kennedy water demand, 6 April.

Crutcher, W., 1999. Personal communication between Willie Crutcher, Redstone Arsenal, and Gabrielle Ehinger, EDAW, Inc., concerning asbestos in proposed structures for LTF, 28 May.

Curry, B., 1998. Personal communication between Beverly Curry, Staff Archaeologist, Redstone Arsenal, and Paige Peyton, Earth Tech, concerning archaeological site types and eligibility within the region of influence for the Laser Test Facility, 25 March.

Davis, J., 1999. Personnel communication between Joe Davis, Redstone Arsenal, and Gabrielle Ehinger, EDAW, Inc., concerning underground storage tanks and asbestos on the arsenal, 19 May.

DeClaire, T., 1998. Personal communication between Tim DeClaire, Canaveral Port Authority, and James E. Zielinski, EDAW, Inc., concerning recent Port Canaveral statistics, 25 February.

Dement, J., 1999. Personal communication between John Dement, Manager, City of Huntsville Natural Gas, and James E. Zielinski, EDAW, Inc., regarding Huntsville's natural gas capacity, 24 May.

Dornbos, B., 1998. Personal communication between Bob Dornbos, Engineering Assistant, Huntsville Utilities, and James E. Zielinski, EDAW, Inc., concerning water supply and services for Madison County, Alabama, area, 23 February.

Dunn and Wu, 1998. Personal communication between Danny Dunn, Natural and Cultural Resources Team Leader, and Carolene Wu, Cultural Resources Manager, Natural and Cultural Resources Division, Directorate of Environmental Management and Planning, Redstone Arsenal, and Brenda Brickhouse and Rachel Jordan, EDAW, Inc., concerning installation cemeteries, archaeological sites, Cold War and World War II structures, and Indian issues, 18 March.

Dynamac Corporation, 1997. *Air Quality Summary and Monitoring at John F. Kennedy Space Center, 1994 Annual Report, Contract No. NAS10-12180*, 6 October.

East Central Florida Regional Planning Council, 1994. *Perspective on Regional Growth, 1992-1996*, October.

East Central Florida Regional Planning Council, 1995. *At This Point in Time—A Physical, Economic, and Social Profile of East Central Florida,* Strategic Regional Planning Series, undated.

East Central Florida Regional Planning Council, 1995a. *Water, Plants and Concrete, An Identification of Significant Regional Resources and Facilities*, December.

East Central Florida Regional Planning Council, 1995b. *What the Future Holds, Summary of Conclusions from Roundtable Discussions on Land Use, Transportation, Housing, and Natural Resources*, September.

East Central Florida Regional Planning Council, undated. *Executive Summary of the Strategic Regional Plan (Draft),* Strategic Regional Planning Series.

Eastern and Western Range, 1997. EWR 127-1, *Range Safety Requirements, 45th Space Wing and 30th Space Wing*, 31 October.

EDAW, Inc., 1998a. Site visit report by EDAW, Inc., concerning trip to Kennedy Space Center and Cape Canaveral Air Station, Florida, 12-16 January 1998.

EDAW Inc., 1998b. Site visit report by EDAW, Inc., concerning trip to Stennis Space Center, Mississippi, 21-22 January 1998.

EDAW Inc., 1998c. Site visit report by EDAW, Inc., concerning trip to Redstone Arsenal and Marshall Space Flight Center, Alabama, 27-28 January 1998.

Environmental Laser, 1997. "Choctaw Nation of Oklahoma," Environmental Laser Homepage [online]. Available: http://www.toners.com/choctaw/

Eubank, O., 1998a. Personal communication between Oscar Eubank, Senior Engineer, New Construction Office, Environmental Management and Planning Directorate, Redstone Arsenal, and James E. Zielinski, EDAW, Inc., concerning natural gas usage at RSA, 25 February.

Eubank, O., 1998b. Personal communication between Oscar Eubank, Senior Engineer, New Construction Office, Environmental Management and Planning Directorate, Redstone Arsenal, and James E. Zielinski, EDAW, Inc., concerning wastewater, solid waste, and natural gas services at RSA, 2 March.

Fine, L., 1998. Personal communication between Lawrence R. Fine, Manager, Air Operations, Marshall Space Flight Center, and James E. Zielinski, EDAW, Inc., regarding Redstone Army Airfield, 2 March.

Florida Department of Community Affairs, 1997. *Florida Coastal Program Guide, A Guide to the Federally Approved Florida Coastal Management Program*,1997 Revision (Includes Statutory Revisions Through 1995), undated.

Florida Department of Natural Resources, 1991. *Earthquakes and Seismic History of Florida,* Division of Resource Management and Florida Geological Survey, Open File Report No. 40, February.

Florida Geological Survey, 1994. Special Publication No. 35, *Florida's Geological History and Geological Resources.*

Florida's Space Coast, undated. "Port Canaveral," Florida's Space Coast Home Page, [online]. Available: www.space-coast.com/port.html, [no date].

Florida's Space Coast, 1997. "Map of Cape Canaveral, Cocoa, Cocoa Beach, Merritt Island, Port St. John, Rockledge, and Vicinity, Florida," *Cocoa Beach Area Guide.*

Garcia, D., 1998. Personal communication between David Garcia, Fire Chief, City of Waveland, and James E. Zielinski, EDAW, Inc., concerning Waveland water/well statistics, 3 March.

Geological Survey of Alabama, 1975. Environmental Geology and Hydrology, Huntsville and Madison County, Alabama, Atlas Series 8, undated.

Geological Survey of Alabama, 1992. *Wellhead Protection Program Development, City of Madison, Alabama, Information Series 71,* Water Resources Division, undated.

Giardino, Marco J., Ph.D., 1997. Letter from Dr. Giardino to Mr. Wayne Gouguet, Facility Manager, MSAAP Industrial Complex, regarding Phase I cultural resources survey of a 3-acre parcel north of Igloo Road for the LTF program, 4 September.

Gouguet, W., 1998. Personal communication between Wayne Gouguet, Facility Manager, MSAAP Industrial Complex, and James E. Zielinski, EDAW, Inc., concerning solid waste levels and disposal facilities for Stennis Space Center, 21 April.

Gouguet, W., 1999. Personal communication between Wayne Gouguet, Facility Manager, Mason Technologies, MSAAP Industrial Complex, and James. E. Zielinski, EDAW, Inc., concerning potential traffic impacts from the Laser Test Facility program, 2 August.

Griess, S., 1999. Personal communication between Scott Griess, Planner II, Huntsville Urban Development Department, and Scotty Bragwell, EDAW, Inc., regarding land use around Redstone Arsenal, 18 May.

Gulf Regional Planning Commission, 1996. *1996 Mississippi Coast Statistical Digest.*

Ham, R., 1999. Personal communication between Rodney Ham, Senior Engineer, Reliant Energy ENTEX, and James E. Zielinski, EDAW, Inc., EDAW, Inc., concerning natural gas line capacity at the Mississippi Army Ammunition Plant, 27 May.

Hancock Chamber of Commerce, undated. Hancock County, Mississippi street map.

Harrison, S., 1998. Personal communication between Sam Harrison, Director of Administration, City of Huntsville Solid Waste Disposal Authority, and James E. Zielinski, EDAW, Inc., concerning capacity of the waste-to-energy plant and levels of waste received or produced during 1997, 10 March.

Havard, J., 1999. Personal communication between John Havard, Electrical Engineer, Mississippi Army Ammunition Plan, and James E. Zielinski, EDAW, Inc., regarding current electricity capacity and demand levels at the MSAAP Industrial Complex, 1 September.

Headquarters, U.S. Army Armament, Munitions and Chemical Command, 1990. *Environmental Assessment for the Layaway of the Mississippi Army Ammunition Plant, Picayune, MS,* July.

Hebert/Smolkin Associates, Inc., 1993. *Targeted Economic Development Program, Volume One*, July. Should be: St. Tammany Economic Development Foundation, 1993. *Targeted Economic Development Program, Volume 1*, 9 July.

Holland, D., 1998. Personal communication between Donna Holland, Environmental Coordinator, Marshall Space Flight Center, Alabama, and Paige Peyton, Earth Tech, concerning historical significance of Buildings 4708 and 4755, 24 March.

Hubbard, 1998. Personal communication between Mike Hubbard, Environmental Officer Directorate Environment and Planning, Redstone Arsenal, and EDAW, Inc. regarding hazardous waste storage, 27 February.

Huntsville Foreign Trade Zone Corporation, 1998. "Why Foreign Trade Zone No.83 is unique," HFTZ homepage, [online]. Available: www.ftz83.com/unique.htm, [no date].

Huntsville OnLine, undated. *Huntsville Facts website*, [online]. Available: www.htimes.com/htimes/htimes/hsvlinks/hsvfacts.html, [no date].

Huntsville Utilities, 1997. *Huntsville Utilities, Preparing to Enter the 21st Century: Our 1996 Annual Report*, undated.

Huntsville Utilities, 1999. *Huntsville Utilities 1998 Annual Report, Neighbors Serving Neighbors*, undated.

Huntsville/Madison County Chamber of Commerce, 1997. "Transportation," *Huntsville - The Sky is Not the Limit*, [online]. Available: http://www.hsvchamber.org/guide/trans, [no date]

Hutto, B., 1998. Personal communication between Bill Hutto, Director, Titusville-Cocoa Airport Authority, and James E. Zielinski, EDAW, Inc., concerning traffic levels at Space Coast Regional, Merritt Island, and Arthur Dunn airfields, 9 April.

Iowa State University Statistical Laboratory, 1998. "National MUIR Database," *USDA-NRCS Soil Survey Division Homepage,* [Online]. Available: http://www.statlab.iastate.edu/soils/muir/, [24 February].

John C. Stennis Space Center, 1992. *Environmental Resources Document, Stennis Space Center*, September.

Kellar, T., 1998. Personal communication between Tim Kellar, Chancery Clerk and County Administrator, Hancock County, James E. Zielinski, EDAW, Inc., and Gabrielle Ehinger, EDAW, Inc., concerning the Pecan Grove Sanitary Landfill, Central Landfill, and solid waste handling in Hancock County, 30 March.

Kennedy Space Center, 1967. *Indian and Historic Site Report: John F. Kennedy Space Center, NASA Site Report,* G.A. Long, Office of Public Affairs, no date.

Kennedy Space Center, 1997. *Ecological Resources Home Page*, [online]. Available: http://atlas.ksc.nasa.gov/env.html, [no date].

Kennedy Space Center, 1998a. Response to Environmental Questionnaire for Laser Test Facility Environmental Assessment, 21 January.

Kennedy Space Center, 1998b. *SBL Integration and Test Facility, KSC BMCO Siting Proposal*, 13 January.

Kennedy Space Center, 1999. Comments received from Mario Busacca, Chief of Planning and Special Projects Group, KSC Environmental Program Office, Kennedy Space Center, on the Laser Test Facility Preliminary Draft EA, July.

Kennedy Space Center Environmental Program Office, 1997. *KSC Environmental Program Office Website,* [Online]. Available: http://www-jj.ksc.nasa.gov/jj-d/epo_about.html, [22 September].

Kershner, M., 1998. Personal communication between Mark Kershner, IRP Program Manager, Cape Canaveral Air Station, and Brenda Brickhouse, EDAW, Inc., concerning a summary of contamination and remediation activities at Launch Complex 15, 19 March.

Klegler, 1999. "The Trail of Tears," *University of San Diego Homepage,* [Online]. Available: http://www.acusd.edu/~klegler/, [25 February].

Larrabee, C., 1998. Personal communication between Carl Larrabee, Utility Director, City of Cocoa utilities, and James E. Zielinski, EDAW, Inc., concerning Brevard County potable water supply, 3 April.

Le Baron, J.F., 1884. "Prehistoric Remains in Florida," *Smithsonian Institution Annual Report for 1884,* Smithsonian Institution, Washington, D.C.

Lockheed Martin Astronautics, 1997. *Space Based Laser Test Facility (STF) Facility Requirements Document, Denver, Colorado*, 17 January.

Lovelace, L., 1998. Personal communication between Leo Lovelace, Industrial Services Representative, Waste Management, Inc., and James E. Zielinski, EDAW, Inc., regarding Pecan Grove Landfill capacity and levels of solid waste received, 21 April.

Lusk, R., 1999a. Personal communication between Rick Lusk, Infrastructure Engineer, Directorate of Public Works, U.S. Army Aviation and Missile Command, Redstone Arsenal, and James E. Zielinski, EDAW, Inc., concerning natural gas usage on the arsenal between 1995 and 1998, 25 May.

Lusk, R., 1999b. Personal communication between Rick Lusk, Infrastructure Engineer, Directorate of Public Works, U.S. Army Aviation and Missile Command, Redstone Arsenal, and James E. Zielinski, EDAW, Inc., concerning electricity demands for FY 98, 2 June.

Lyda, C., 1998. Personal communication between Carlotta Lyda, Secretary II, City of Huntsville Water Pollution Control, and James E. Zielinski, EDAW, Inc., concerning capacity and usage totals for Huntsville Wastewater Treatment Plants, 23 February.

Marshall Space Flight Center, Environmental Engineering and Management Office, 1997. *Environmental Resource Document*, [online]. Available: http://eemo.msfc.nasa.gov/eemo/erd/ERDindex.html, [April].

Mason, D., 1998. Personal communication between Debbie Mason, Marketing Assistant, Melbourne International Airport, and James E. Zielinski, EDAW, Inc., concerning total passengers for 1997, 4 March.

McNeely, M., 1998. Personal communication between Mike McNeely, Environmental Engineer, Mason Technologies, Inc., and Brenda Brickhouse, EDAW, Inc., concerning quantities of hazardous waste generation at MSAAP, 27 February.

Melbourne International Airport, 1997. Welcome to Melbourne International Airport, [online]. Available: http://www.mlbair.com, [no date].

Merritt Island National Wildlife Refuge, no date. Brochures on Merritt Island National Wildlife Refuge.

Mississippi Army Ammunition Plant, 1999a. Comments from Mike McNeely, Mason Technologies, Mississippi Army Ammunition Plant, on the Laser Test Facility Preliminary Draft EA, 17 July.

Mississippi Army Ammunition Plant, 1999b. Map from Ron Magee showing Airport Layout Plan for New Picayune Airport, Picayune, Mississippi, 10 August.

Mississippi Band of Choctaw Indians, 1997. "Halito: Greetings from the Mississippi Band of Choctaw Indians," Home page, [online]. Available: http://www.choctaw.org/index.html#Mississippi, [no date].

Mississippi Department of Archives and History, 1990. Letter from Elbert R. Hilliard, State Historic Preservation Officer, to Dana G. Matherly, Chief, EN/OR Division, Department of the Army, Mississippi Army Ammunition Plant, regarding Inactivation of the Mississippi Army Ammunition Plant, Hancock County, 11 July.

Mississippi Department of Archives and History, 1998. Letter from Roger G. Walker, Review and Compliance Officer, Mississippi Department of Archives and History, to Wayne Gouguet, Mason Technologies, Inc., regarding the "no effect" determination for undertakings at Stennis Space Center tracts 1 and 2, 21 September.

Mississippi Gulf Coast, 1998. *Gulfport-Biloxi Regional Airport*, [online]. Available: http://www.gulfcoast.org/gpt, [no date].

Mississippi State University, 1997. 1:100K U.S. Geological Service, Digital Line G.

Moore, C.B., 1922. "Mound Investigations on the East Coast of Florida," in *Additional Mounds of Duval and Clay Counties, Florida,* Heye Foundation Indian Notes and Monographs, Museum of the American Indian, New York.

Moore, J., 1998. Personal communication between Janell Moore, Hancock County Chamber of Commerce, and James E. Zielinski, EDAW, Inc., concerning utility capacity and usage in Hancock County, MS, 19 February.

Mullican, J., 1999. Personal communication between Jim Mullican, ENTEC, and James E. Zielinski, EDAW, Inc., concerning natural gas demand at the Mississippi Army Ammunition Plant, 24 May.

Myers, R. and J. Ewell, 1992. *Ecosystems of Florida*, University of Central Florida Press: Orlando.

National Aeronautics and Space Administration, 1986. *Environmental Resources Document*, John F. Kennedy Space Center, November.

National Aeronautics and Space Administration, 1990. *Supplemental Final Environmental Impact Statement, Space Shuttle Advanced Solid Rocket Motor Program,* John C. Stennis Space Center and George C. Marshall Space Flight Center, August.

National Aeronautics and Space Administration, 1992. *Facilities Master Plan, Volume 1*, John F. Kennedy Space Center, 11 December.

National Aeronautics and Space Administration, 1993. *NASA Safety Policy and Requirements Document, NHB 1700.1 (V1-B), Effective Date: June 1, 1993* [Online]. Available: http://nodis.gsfc.nasa.gov/Library/Directives/NASA-WIDE/Procedures/Organization_and_Administration/N_HB_1700_1_(V1-B).html.

National Aeronautics and Space Administration, 1995a. *Final Environmental Impact Statement for the Cassini Mission*, June.

National Aeronautics and Space Administration, 1995b. *Historic Preservation Plan, File No. SSCHP-4,* John C. Stennis Space Center, MS, April.

National Aeronautics and Space Administration, 1996. *Environmental Resource Document, 130915.EO.01*, George C. Marshall Space Flight Center, Huntsville, Alabama, June.

National Aeronautics and Space Administration, 1997a. *Environmental Resources Document, KSC-DF-3080, Revision C,* John F. Kennedy Space Center, February.

National Aeronautics and Space Administration, 1997b. *Final Environmental Impact Statement of Engine Technology Support for NASA's Advanced Space Transportation Program, with Emphasis on Liquid Oxygen and Kerosene Engine Technology Development*, April.

National Aeronautics and Space Administration, 1997c. *Final Environmental Impact Statement of Engine Technology Support for NASA's Advanced Space Transportation Program, with Emphasis on Liquid Oxygen and Kerosene Engine Technology Development*, George C. Marshall Space Flight Center and John C. Stennis Space Center, July.

National Aeronautics and Space Administration, 1997d. *John C. Stennis Space Center Facilities Master Plan.*

National Aeronautics and Space Administration, 1998 [online]. Available: http://atlas.ksc.nasa.gov. [24 February].

National Aeronautics and Space Administration, 1998. Three-ring binder; general information/welcome package on Stennis Space Center and surrounding area and a Summary of Responses to LTF Questionnaire, 14-20 January.

National Aeronautics and Space Administration/GB Tech, 1998. *Survey for Five Endangered Animal Species at the Stennis Space Center,* Hancock Mississippi, 5 August.

National Aeronautics and Space Administration/Marshall Space Flight Center Transportation Management Services, 1997. *Overview,* 28 August.

National Archives and Records Administration, Office of the Federal Register, 1981. Code of Federal Regulations (CFR), Title 36, *Parks, Forest, and Public Property,* Chapter I, National Park Service, Department of the Interior, Part 60, "National Register of Historic Places," Subpart 60.4, "Criteria for Evaluation."

National Archives and Records Administration, Office of the Federal Register, 1981. Code of Federal Regulations (CFR), Title 36, *Parks, Forest, and Public Property,* Chapter I, "National Park Service, Department of the Interior," Part 800, "Protection of Historic and Cultural Properties", Subpart B, "The Section 106 Process," Section 800.9, "Criteria of Effect and Adverse Effect."

National Archives and Records Administration, Office of the Federal Register, 1981. Code of Federal Regulations (CFR), Title 36, *Parks, Forest, and Public Property,* Chapter I, "National Park Service, Department of the Interior," Part 800, "Protection of Historic and Cultural Properties," Subpart C, "Special Provisions", Section 800.11, "Properties Discovered During Implementation of an Undertaking."

National Archives and Records Administration, Office of the Federal Register, 1989. Code of Federal Regulations (CFR), Title 29, Labor, Part 1910, Occupational Safety and Health Standards, Subpart G, Occupational Health and Environmental Control, Section 1910.95, Occupational Noise Exposure, 7 June.

National Archives and Records Administration, Office of the Federal Register, 1995. Code of Federal Regulations (CFR), Title 40, Protection of the Environment, Part 93, Section 93.135(b), 1 July.

National Archives and Records Administration, Office of the Federal Register, 1996a. Code of Federal Regulations (CFR), Title 40, *Protection of Environment,* Chapter V, *Council on Environmental Quality,* Parts 1500-1508, Revised, 1 July.

National Archives and Records Administration, Office of the Federal Register, 1996b. Code of Federal Regulations (CFR), Title 40, *Protection of Environment,* Chapter V, *Council on Environmental Quality,* Part 1508, *Terminology and Index,* Section 1508.9, *Environmental Assessment,* Revised, 1 July.

National Archives and Records Administration, Office of the Federal Register, 1997. Code of Federal Regulations (CFR), Title 49, *Transportation,* Subtitle B, *Other Regulations Relating to Transportation,* Chapter 1, *Research and Special Programs Administration, Department of Transportation,* Parts 100-199, Revised, 1 October.

National Ocean Service, 1999a, Jacksonville, Sectional Aeronautical Chart, 25 February.

National Ocean Service, 1999b, Atlanta, Sectional Aeronautical Chart, 25 March.

National Ocean Service, 1999c, New Orleans, Sectional Aeronautical Chart, 17 June.

National Park Service, 1983. *An Architectural and Engineering Survey and Evaluation of Facilities at Cape Canaveral Air Force Station, Brevard County, Florida,* Southeast Regional Office, no date.

National Park Service, 1984. *An Archaeological Survey of Cape Canaveral Air forces Station, Brevard County, Florida,* Southeast Regional Office, no date.

National Park Service, 1999. "The Effects of Air Pollutants on Wildlife and Implications in Class I Areas," Tonnie G. Maniero [online]. Available: http://www.aqd.nps.gov/ard/wildl.htm. [14 December].

National Resources Defense Council, Inc., 1996. "Huntsville International Airport," *Flying Off Course, Environmental Impacts of America's Airports,* [online]. Available: http://www.nrdc.org/nrdcpro/nrdcpro/foc/hualhi.html, [25 June].

National Wetlands Inventory, 1999. GIS data of wetlands on Cape Canaveral Air Station, Florida.

New South Associates, 1993. *Historic Properties Survey, Cape Canaveral Air Force Station, Brevard County, Florida*, December.

New South Associates, 1996. *45th Space Wing Cultural Resource Management Plan: Patrick Air Force Base and Cape Canaveral Air Station, Brevard County, Florida,* Technical Report No. 386, May.

Noles, B., 1998. Personal communication between Bobby Noles, Post Traffic Manager, Office of the Director of Public Works, Redstone Arsenal, Alabama, and James E. Zielinski, EDAW, Inc., concerning statistics for major arsenal roads, 3 March.

Noles, B., 1999. Personal communication between Bobby Noles, Post Traffic Manager, Office of the Director of Public Works, Redstone Arsenal, Alabama, and James E. Zielinski, EDAW, Inc., concerning AMCOM transportation-related agreements with MSFC and related topics, 2 June.

NUI Corporation, undated. City Gas Company of Florida, [online]. Available: http://www.nui.com/t-citygas.htm.

Operation Enterprise, 1996. *Armament Retooling and Manufacturing Support Program/Mississippi AAP website*, [online]. Available: http://www.openterprise.com/nextpage.htm, [no date].

Patrick Air Force Base, 1999. Comments received from Joan Albury, 45 CES/CEV and Angy Chambers, Brian Barfus, Darren May, Kathleen Pohlhammer, and Pius Sanabani, Environmental Support Contract, Patrick Air Force Base, on the Laser Test Facility Preliminary Draft EA, July.

Patterson, S., 1998. Personal communication between Susanna Patterson, Florida Department of Labor and Employment Security, Bureau of Labor Market Information, and James E. Zielinski, EDAW, Inc., concerning Brevard County statistics, 18 February.

Phillips, G., 1998. Personal communication between Gene Phillips, President, Phillips Aviation, and James E. Zielinski, EDAW, Inc., concerning data on Stennis International Airport, 23 March.

Redstone Arsenal, 1989. *Master Plan Narrative for Redstone Arsenal, Alabama,* U.S. Army Aviation and Missile Command, Directorate of Environmental Management and Planning, December.

Redstone Arsenal, 1998a. General Information and Overview provided for Redstone Arsenal/Marshall Space Flight Center, Alabama, for Space-Based Laser Facility Site Assessment Review, 27-28 January.

Redstone Arsenal, 1998b. Comments received from Redstone Arsenal on the *Preliminary Draft Environmental Assessment of the Integration, Assembly, Test, and Checkout of National Missile Defense Components at Redstone Arsenal, Alabama*, 17 December.

Redstone Arsenal, 1999a. Comments received from Carolene Wu, Dan Seaver, and Chris Slayton, Directorate of Environmental Management and Planning, U.S. Army Aviation and Missile Command, on the Laser Test Facility Preliminary Draft EA, July.

Redstone Arsenal, 1999b. Comments received from Susan F. Webber and Valerie Shippers, Directorate of Environmental Management and Planning, U.S. Army Aviation and Missile Command, on the Laser Test Facility Coordinating Final EA, December.

Riberich, R., 1998. Personal communication between Ron Riberich, TVA Water Management, and James E. Zielinski, EDAW, Inc., concerning Port of Decatur traffic, 10 March.

Rouse, I., 1951. "A Survey of Indian River Archaeology, Florida", a Yale University Publication in *Anthropology No. 44*, Yale University, New Haven, Connecticut.

Sacramento Metropolitan Air Quality Management District, 1997. *Air Quality Thresholds of Significance,* spreadsheets provided by Jane Hunter Ross, R.E.M., HQ AFSPC/CEVP, 7 May 1999.

Sanders, D., 1998. Personal communication between Dan Sanders, Traffic Engineer, Engineering Department, City of Huntsville, and James E. Zielinski, EDAW, Inc., concerning capacity and Average Daily Traffic and lack of LOS or PHV for Huntsville roadways, 20 February.

Sisco, T., 1998. Personal communication between Tom Sisco, Engineering Department, City of Huntsville, and James E. Zielinski, EDAW, Inc., regarding remaining rail lines on the Redstone Arsenal, 2 April.

Smith, M., 1998. Personal communication between Marilyn N. Smith, Office Manager, City of Waveland Public Works, and James E. Zielinski, EDAW, Inc., concerning Waveland natural gas and water statistics, 2 March.

Southern Mississippi Planning and Development District, 1991. *Hancock County Comprehensive Plan*.

Southern Mississippi Planning and Development District, 1998. *SMPDD Home Page,* [online]. Available: http://www.smpdd.com/cities, [11 February].

Stark, J., 1998. Personal communication between John Stark, National Utility Investors, and James E. Zielinski, EDAW, Inc., regarding NUI Corporation's throughput of natural gas for Brevard County, 11 March.

State of Alabama, 1997. 1996 Alabama Traffic Flow Map, Alabama Department of Transportation, Bureau of Transportation Planning.

Stennis Space Center, 1997a. *Environmental Resources Document for the National Aeronautics and Space Administration, John C. Stennis Space Center, Hancock County, Mississippi, Revision 2,* September.

Stennis Space Center, 1997b. Title V, Section C, Emissions Summary, Point Sources, Revised, 12 March.

Stennis Space Center, 1998. Response to Environmental Questionnaire for Laser Test Facility Environmental Assessment, 21 January.

Stirling, G.M., 1935. Map of Merritt Island and Peninsula, Brevard County, Florida, showing mounds in the Canaveral Region. Map on file (Accession No. 31-13), Peabody Museum, Harvard University, Cambridge, Massachusetts.

Stojić, A., 1998. Personal communication between Alicia Stojić, Research Assistant, Hancock County Port and Harbor Commission, and James E. Zielinski, EDAW, Inc., regarding Port Bienville, 10 March.

Sung, A., 1998. Personal communication between Angelina Sung, Airport Manager, Rockledge Air Park, and James E. Zielinski, EDAW, Inc., concerning current use and status of the air park, 23 April.

Taff, A.E., 1998. Personal communication between Albert Edgar (Ed) Taff, Shuttle Landing Facility Operations Officer, Kennedy Space Center, and James E. Zielinski, EDAW, Inc., concerning traffic levels and commercial flights at the SLF, 14 April.

Taff, A.E., 1999. Personal communication between Albert Edgar (Ed) Taff, Shuttle Landing Facility Operations Officer, Kennedy Space Center, and James E. Zielinski, EDAW, Inc., concerning traffic levels and capacity at the SLF, 20 May.

Taylor, D., 1998. Personal communication between David Taylor, Gulf Regional Planning Commission, and James E. Zielinski, EDAW, Inc., concerning roadway traffic levels in and around Stennis Space Center, 3 March.

Taylor, J., 1998. Personal communication between Jeff Taylor, Chief Water Operator, Water and Wastewater Board of the City of Madison, and James E. Zielinski, EDAW, Inc., concerning 1997 water consumption, 18 March.

Tays, S., 1997. Personal communication between Stu Tays, Deputy Program Manager, FSEC, Incorporated, and Thomas M. Craven, U.S. Army Space and Strategic Defense Command, regarding LMA Based Laser Program Environmental Safety Responses, 27 August.

Thalasinos, W., 1999. Personal communication between Wayne Thalasinos, KSC Energy Manager, and James E. Zielinski, EDAW, Inc., regarding KSC natural gas capacity and demand and electricity availability at proposed LTF sites, 9-10 September.

The Advertiser Company, Incorporated, 1997. "Post Map," *Redstone Arsenal, 1997-1998 Installation Guide,* undated.

The Gulf of Mexico Information Network, undated. *GIN Website*, [online]. Available: http://pelican.gmpo.gov, [no date].

Titusville–Cocoa Airport Authority, 1998. Airports of Florida's Space Coast, [online]. Available: http://www.flairport.com/index.html, [March].

U.S. Air Force, 1994. *Historic American Engineering Record of Complex 13, 26, 34, Cape Canaveral Air Station, Cape Canaveral, Florida,* no date.

U.S. Air Force, 1996. *Draft Environmental Impact Statement for the Program Definition and Risk Reduction Airborne Laser Phase*, September.

U.S. Air Force, 1997. *Draft Environmental Impact Statement, Evolved Expendable Launch Vehicle Program*, December.

U.S. Air Force, 1998. *Final Environmental Impact Statement, Evolved Expendable Launch Vehicle Program,* April.

U.S. Army Aviation and Missile Command, 1999. *Environmental Assessment, Endangered Species Management Plan.*

U.S. Army Corps of Engineers, 1990. *Environmental Assessment for the Layaway of the Mississippi Army Ammunition Plant, Picayune, MS*, July.

U.S. Army Corps of Engineers, 1997. Schematic Drawings - *FY97 RDT&E Project No. BMDO-220, Laser Test Facility Phase I Performance Test Chamber Complex, Volume 1,* Engineering and Support Center, Huntsville, various dates.

U.S. Army Corps of Engineers, 1997. *65% Status Review, FY 97 RDT&E Project No. BMDO-220, LTF Phase I, Performance Test Chamber Complex, 4 August.*

U.S. Army Corps of Engineers and 45th Space Wing, 1994. *Historic Properties Survey, Cape Canaveral Air Force Station, Brevard County, Florida,* New South Associates Technical Report 183, no date.

U.S. Army Corps of Engineers, Mobile District, 1988a. *Historic Properties Investigation of a Proposed Security Fence for Fuel Storage Area #1, Cape Canaveral Air Station, Brevard County, Florida.* Prepared for the Eastern Space and Missile Center, Patrick Air Force Base.

U.S. Army Corps of Engineers, Mobile District, 1988b. *Cultural Resources Investigations for National Aeronautics and Space Administration at National Space Technology Laboratories NSTL, Mississippi,* May.

U.S. Army Corps of Engineers, Mobile District, 1989. *Historic Properties Investigations of Several Proposed Projects: Launch Complex 17 Security Fence Upgrade, TGSF Storage Facilities, Launch Complex f01 Line of Sight, Cape Canaveral Air Force Station, Brevard County, Florida.* Prepared for the Eastern Space and Missile Center, Patrick Air Force Base.

U.S. Army Corps of Engineers, Mobile District, 1990. *Historic Properties Investigation of the Centaur Processing Facility, Interim Spin Test Facility, Missile Assembly Building Parking.* Prepared for the Eastern Space and Missile Center, Patrick Air Force Base.

U.S. Army Corps of Engineers, Mobile District, 1991. *Historic Properties Investigation of the Chemical Testing Laboratory, Wastewater Treatment Facility, Command Control Building Addition Fence.* Prepared for the Eastern Space and Missile Center, Patrick Air Force Base.

U.S. Army Corps of Engineers, Water Resources Support Center, 1996. *Waterborne Commerce of the United States, Calendar Year 1995*, Part 2, "Waterways and Harbors—Gulf Coast, Mississippi River System and Antilles," no date.

U.S. Army Environmental Center, 1994. *Air Pollution Emission Statement, Redstone Arsenal, Huntsville, Alabama,* 12 January.

U.S. Army Materiel Command, 1996. *Relocation of ATCOM and Other Army Organizations to Redstone Arsenal, Huntsville, Alabama*, February.

U.S. Army Missile Command, 1983. *Analysis of Existing Facilities and Environmental Assessment Report Master Plan*, Redstone Arsenal, Alabama, August.

U.S. Army Missile Command, 1994. *Final Environmental Assessment for Redstone Arsenal Master Plan Implementation, Redstone Arsenal*, Alabama, December.

U.S. Army Missile Command, 1996. *Spill Prevention Control and Countermeasure (SPCC) Plan, Installation Spill Contingency Plan (ISCP) for Oil and Hazardous Substances, Volume I,* Redstone Arsenal, Alabama, May.

U.S. Army Missile Command, 1997. *Draft Architectural Assessment of the World War II Military and Civilian Works, U.S. Army Missile Command, Redstone Arsenal, Madison, Alabama, Final Report*, Pan American Consultants, Inc., Final Report, March.

U.S. Army Space and Missile Defense Command, 1998. *Tactical High Energy Laser Advanced Concept Technology Demonstration Environmental Assessment*, 27 April.

U.S. Army Space and Strategic Defense Command, 1994. *Theater Missile Defense Extended Test Range Final Environmental Impact Statement*, November.

U.S. Army Strategic Defense Command, 1989. *Draft Environmental Impact Statement Proposed Actions at U.S. Army Kwajalein Atoll*, June.

U.S. Army Strategic Defense Command, 1990. *HEDI Kite I Noise Monitoring Technical Report, White Sands Missile Range, Las Cruces, New Mexico.*

U.S. Department of Defense, 1996. DoD Instruction 4715.9, *Environmental Planning and Analysis*, 3 May.

U.S. Department of the Air Force, 1990. *Titan IV Solid Rocket Motor Upgrade Program Environmental Assessment, Cape Canaveral Air Force Station, Florida, and Vandenberg Air Force Base, California*.

U.S. Department of the Air Force, 1994. *Historic American Engineering Record of Complex 19, Cape Canaveral Air Station, Cape Canaveral, Florida,* no date.

U.S. Department of the Air Force, 1996. *Final Environmental Impact Statement Disposal of K.I. Sawyer Air Force Base, Michigan, Environmental Impact Statement,* February.

U.S. Department of the Air Force and National Aeronautics and Space Administration, 1993. *Final Draft, National Launch System, Environmental Evaluation of Alternatives*, March.

U.S. Department of the Army, 1976. *Environmental Impact Statement for Mississippi Army Ammunition Plant, Volume 1*, January.

U.S. Department of the Army, 1996. *Environmental Assessment, Relocation of ATCOM and Other Army Organizations to Redstone Arsenal, Huntsville, AL*, February.

U.S. Department of the Army, 1997. *Environmental Assessment for Resource Recovery and Recycling Operations at Redstone Technical Test Center Test Area 10*, July.

U.S. Department of the Army, 1999. Memorandum for commander's Representative, Mississippi Army Ammunition Plant re Request for Variance to Prepare an Integrated Cultural Resources Management Plan at Mississippi Army Ammunition Plant, April.

U.S. Department of the Interior, 1987. *Habitat Management Guidelines for the Bald Eagle in the Southeast*, January.

U.S. Department of the Interior, 1998. Comments received from the Fish and Wildlife Service, Jacksonville, Florida, on listed species on Kennedy Space Center, 21 July.

U.S. Department of Transportation, 1996. *Environmental Assessment of the Kodiak Launch Complex, Kodiak Island, Alaska*, Federal Aviation Administration, May.

U.S. Environmental Protection Agency, 1971. *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*, Office of Noise Abatement and Control, Washington D.C. 20460, 31 December.

U.S. Environmental Protection Agency, 1995. *AP-42 Compilation of Air Pollutant Emission Factors, Volume I (Fifth Edition), Section 13.2.3, Heavy Construction Operations* [Online]. Available: http://www.epa.gov [5 May 1999].

U.S. Environmental Protection Agency, 1998. *AP-42 Compilation of Air Pollutant Emission Factors, Volume I (Fifth Edition), Section 1.3, Fuel Oil Combustion* [Online]. Available: http://www.epa.gov [5 May 1999].

U.S. Environmental Protection Agency, 1999a. "AP-42, Fifth Edition, Volume I, Chapter 1, External Combustion Sources - Section 1.3: Fuel Oil Combustion (Supplement E)," *Technology Transfer Network, Clearinghouse for Inventories and Emissions Factors Home Page,* [Online]. Available: http://www.epa.gov/ttnchie1/ap42c1.html, [5 May].

U.S. Environmental Protection Agency, 1999b. "AP-42, Fifth Edition, Volume I, Chapter 3, Stationary Internal Combustion Sources - Section 3.4: Large Stationary Diesel and All Stationary Dual-fuel Engines (Supplement B)," *Technology Transfer Network, Clearinghouse for Inventories and Emissions Factors Home Page,* [Online]. Available: http://www.epa.gov/ttn/chief/ap42c3.html, [5 May].

U.S. Environmental Protection Agency, 1999c. "AP-42, Fifth Edition, Volume I, Chapter 13, Miscellaneous Sources - Section 13.2.3: Heavy Construction Operations," *Technology Transfer Network, Clearinghouse for Inventories and Emissions Factors Home Page,* [Online]. Available: http://www.epa.gov/ttnchie1/ap42c13.html, [5 May].

U.S. Fish and Wildlife Service, 1998. *Wheeler National Wildlife Refuge*, [Online]. Available: www.fws.gov/r4eao/wildlife/nwrwlr.html, [August].

U.S. Fish and Wildlife Service, 1999a. "Wheeler National Wildlife Refuge Questions and Answers," [Online]. Available: www.fws.gov/r4eao/wildlife/nwrwlr2.html.

U.S. Fish and Wildlife Service, 1999b. Response to Letter Requesting Consultation Pursuant to Section 7 of the Endangered Species Act, 30 November.

U.S. Fish and Wildlife Service and Florida Department of Natural Resources, 1992. *Management Agreement for Submerged Lands within Boundaries of the Key West and Great White Heron National Wildlife Refuge.*

University of West Florida, 1990. *Archaeological Assessment of Six Selected Areas in Brevard County: A First Generation Model,* Report of Investigation #32, Archaeology Institute, no date.

Urban Land Institute, 1997. *Development Impact Assessment Handbook*, 2nd Edition.

Van Nostrand Reinhold, 1998. *Comprehensive Chemical Contaminants Series*, [CDROM]. Available: John Wiley & Sons, September.

Voska, N., 1998. Personnel communication between Ned Voska, Kennedy Space Center, and Brenda Brickhouse, EDAW, Inc., concerning fuel management; hazardous waste storage; and pollution prevention, spill, and contingency plans at Kennedy Space Center, 27 February.

Voska, N., 1999. Personnel communication between Ned Voska, Kennedy Space Center, and Gabrielle Ehinger, EDAW, Inc., concerning lead-based paint and PCBs at Kennedy Space Center, 20 May.

Welch, A., 1998. Personal communication between Andy Welch, Manager, Marine Operations, Redstone Arsenal, and James E. Zielinski, EDAW, Inc., concerning barge and port operations at RSA, 3 March.

Wiley, G.R., 1954. "Burial Patterns in the Burns and Fuller Mounds, Cape Canaveral, Florida," *Florida Anthropologist*, Volume 7.

Wilkinson, J., 1998. Personal communication between Jim Wilkinson, Senior Transportation Planner, Gulf Regional Planning Commission, and James E. Zielinski, EDAW, Inc., concerning major roadways in the Stennis Space Center area, 4 March.

Wu, C., 1999. Personal communication between Carolene Wu, Natural and Cultural Resources Manager, Redstone Arsenal, and Paige Peyton, Earth Tech, concerning the status of World War II and Cold War Historic Buildings and Structures Reports and the potential eligibility of Building 8027 and 70 weapons storage igloos, 7 April.

Young, R., 1998. Personal communication between Rebecca Young, Kennedy Space Center, and James E. Zielinski, EDAW, Inc., concerning the new Schwartz Road Landfill, the Brevard County landfill, and the KSC solid waste flow, 24 March.

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7.0 AGENCIES AND INDIVIDUALS CONTACTED

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Alabama Department of Environmental Management
Montgomery, Alabama

Brevard County Solid Waste Management Department
Cocoa, Florida

Chamber of Commerce
Hancock County, Mississippi

City of Cocoa

- Dyal Waste Treatment Plant
- Cocoa Utilities
- Cocoa, Florida

City of Huntsville
Huntsville, Alabama

- Department of Engineering
- Department of Transportation
- Huntsville Solid Waste Energy Facility
- Railroad Authority
- Solid Waste Disposal Authority

Department of Wildlife, Fisheries, and Parks
Jackson, Mississippi

- Mississippi Natural Heritage Foundation

Dynamac Corporation
John F. Kennedy Space Center, Florida

ENTEC
Stennis Space Center, Mississippi

Environmental Protection Agency, Region IV
Atlanta, Georgia

Florida Coastal Management Program,
Florida

Florida Department of Community Affairs,
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Florida's Space Coast Office of Tourism
Cape Canaveral, Florida

Gulf Regional Planning Commission
Gulfport, Mississippi

Huntsville Utilities
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- Gas Department
- Personnel Department
- South Memorial Parkway Water Treatment Plant
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Industrial Operations Command
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- Corps of Engineers
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NASA/Kennedy Space Center
John F. Kennedy Space Center, Florida

- Natural Resource Program

NASA/Stennis Space Center
Stennis Space Center, Mississippi

North Alabama Industrial Development Association
Decatur, Alabama

North Alabama Regional Council of Governments
Huntsville, Alabama

Redstone Arsenal
Redstone Arsenal, Alabama

- Environmental Management and Planning Directorate, New Construction Office
- Natural and Cultural Resources Manager
- Office of the Director of Public Works
- Planning Office
- U.S. Army Aviation and Missile Command

Shuttle Launch Facility
Kennedy Space Center, Florida

State of Mississippi
Jackson, Mississippi

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- Department of Transportation

Stennis Space Center
Stennis Space Center, Mississippi

- Center Operations

Teledyne Brown Engineering
Huntsville, Alabama

Tennessee Valley Authority
Muscle Shoals, Alabama

- Economic Development Group

Titusville-Cocoa Airport Authority
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Appendix A
Distribution List

APPENDIX A
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U.S. Army Missile Command Library
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Building 112
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Appendix B
Correspondence

DEPARTMEN OF THE ARMY

REPLY TO ATTENTION OF

Environmental Division

Mr. Larry Goldman
Field Supervisor
U.S. Fish and Wildlife Service
P.O. Drawer 1190
Daphne, Alabama 36256

Dear Mr. Goldman:

In compliance with the National Environmental Policy Act (NEPA) and the Council on Environmental Quality regulations implementing NEPA, an Environmental Assessment (EA) is being prepared by the U.S. Army Space and Missile Defense Command in support of the construction of a high energy laser test facility for a Laser Readiness Demonstrator (LRD). This LRD is in support of the Space Based Laser (SBL), a defensive system currently under conceptual design.

The purpose of the SBL would be to negate hostile ballistic missiles in the boost phase, thus reducing the potential for release of chemical or biological submunitions over the U.S. and its allies' protected areas. The SBL is being conceptually designed and developed to be a flexible, near-term, and cost-effective option to augment and extend national defenses. The SBL would support both National and Theater Missile Defense. The Space Based Laser Readiness Demonstrator (SBLRD) Laser Test Facility (LTF) is necessary to demonstrate the SBL technology. Currently, no facility exists with the capability for testing the SBLRD chemical laser or for pre-flight testing of the SBLRD spacecraft.

Validation of the SBLRD technology would be accomplished through a series of ground tests to determine if further system development and integration is warranted. The EA currently being prepared is limited to the construction and operation of the SBLRD LTF. Further testing, production, and deployment of the SBL system would not be planned unless the SBLRD development and testing is successful. Further NEPA documentation would be prepared prior to any decision on additional construction, testing, or deployment, should follow-on activities be pursued.

The EA will describe and address the potential environmental impacts of construction and operation of the SBLRD LTF at four candidate installations, Redstone Arsenal, Alabama, Stennis Space Center, Mississippi, Kennedy Space Center, Florida, and Cape Canaveral, Florida (see enclosed location maps). The SBLRD LTF would consist of a Laser Test Complex of approximately 6 hectares (15 acres) surrounded by a 1.2-kilometer (0.75-mile) radius safety zone. The safety zone would be established for areas that could potentially be affected by the laser reactants. Additional support facilities would be located outside the safety zone within an area of approximately 10 hectares (25 acres).

The SBLRD is a high-energy chemical laser that is powered by a chemical reaction. SBLRD operation is similar to a rocket engine in which a fuel (nitrogen trifluoride/fluorine mix (NF_3/F_2)) is reacted with an oxidizer (nitrogen trifluoride (NF_3)). Free, excited fluorine atoms are one of the combustion products. Just downstream from the reactor, deuterium and helium are injected into the exhaust. Deuterium combines with the excited fluorine to yield excited deuterium fluoride (DF) molecules, while the helium stabilizes the reaction and controls the temperature. The laser's resonator mirrors are wrapped around the excited exhaust gas, and optical energy is extracted. Products of the reaction are hydrogen fluoride (HF), DF, and molecular nitrogen (N_2). The reactor is actively cooled and can be run until the fuel supply is exhausted. The laser's output power can be varied over a wide range by altering the fuel flow rates and mixtures.

Three 50-second laser element performance tests would be performed per year during the first phase of testing, and three 50-second research and development integration tests would be conducted per year during the second phase. The noise produced would be at levels of 140 decibels (dB) within 1-meter (3 feet) of the Pressure Recovery System (PRS) nozzle. The unattenuated noise level would be 93 dB at approximately 230 meters (750 feet) from the PRS nozzle.

In order to complete the NEPA process, we are requesting an informal Endangered Species Act Section 7 compliance list from your office. A table of threatened and endangered plant and wildlife species that were derived from information provided by the candidate installations from previous EAs is enclosed.

We would appreciate your concurrence with these lists for the proposed site locations in your jurisdiction. If you desire additional species to be addressed, please let us know as soon as possible.

Please review this information and provide comments by July 24, 1998, to Commander, U.S. Army Space and Missile Defense Command, Attention: SMDC-EN-V (Mr. Thomas M. Craven), P.O. Box 1500, Huntsville, Alabama 35807-3801 or by data facsimile (256) 955-5074.

If you have any questions or comments, please contact Mr. Thomas M. Craven at (256) 955-1533.

Sincerely,

Daniel W. McCauley
Acting Deputy Chief of Staff,
Engineer

Enclosures

Copies Furnished:

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Mr. Mario Busacca, National Aeronautical Space Administration/Kennedy Space Center, Mail Code: JJ-D, Kennedy Space Center, Florida 32899
Mr. Mike McNeely, Mason Technologies, Inc., Stennis Space Center, Mississippi 39529-7099
Commander, U.S. Army Aviation and Missile Command, ATTN: AMSAM-RA-EMP (Mike Hubbard), Redstone Arsenal, Alabama 35898-5300
Mr. Ron Magee, National Aeronautical Space Administration, Building 1100, Room 3012-B, Stennis Space Center, Mississippi 39529

REPLY TO ATTENTION OF

Environmental Division 02 JUL 1998

SMDC-EN-V READING FILE

Mr. Donald Palmer
U.S. Fish and Wildlife Service
6620 Southpoint Drive, Suite 310
Jacksonville, Florida 32216

Dear Mr. Palmer:

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If you have any questions or comments, please contact Mr. Thomas M. Craven at (256) 955-1533.

Sincerely,

Daniel W. McCauley
Acting Deputy Chief of Staff,
Engineer

Enclosures

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Mr. Mike McNeely, Mason Technologies, Inc., Stennis Space Center,
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Commander, U.S. Army Aviation and Missile Command, ATTN: AMSAM-RA-EMP (Mike Hubbard), Redstone Arsenal, Alabama 35898-5300

Mr. Ron Magee, National Aeronautical Space Administration,
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DEPARTMENT OF THE ARMY

REPLY TO ATTENTION OF

Environmental Division

Ms Elizabeth Ann Brown
Alabama Historical Commission
468 South Perry Street
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Dear Ms. Brown:

The Ballistic Missile Defense Organization (BMDO) is currently conducting a laser research program aimed at developing technology for directed energy activities for ballistic missile defense that has global capability. For your information, a description of that program is enclosed. One of the first steps in that program is testing of the technology and concepts. To that end, BMDO is considering the construction of a high-energy laser test facility (LTF).

The BMDO tasked the U.S. Army Space and Missile Defense Command (USASMDC) to prepare an Environmental Assessment (EA) for the construction of this high-energy LTF. Redstone Arsenal, Alabama is one of four sites being considered to host this facility. The site map for placement of the proposed facility at the site in Alabama is enclosed. The facility will consist of a 6-hectare (15-acre) laser test complex surrounded by a 1.2-kilometer (0.75-mile) radius safety zone; and a 10-hectare (25-acre) campus-type support complex located outside the safety zone. Ground disturbance will occur from the construction of new facilities and utilities and some existing buildings and structures may require modification.

The EA team is currently in the process of collecting information related to archeological, historical, and traditional resources within the area of potential effect and conducting analysis to determine if there will be any effects as a result of the LTF program. We are working closely with the installations' cultural resources managers to ensure that all historic properties are identified. As soon as our data collection and analysis are complete, we will contact your office for a review of our determination of effect. The draft EA is scheduled for

distribution to various agencies and the public in early 1999. At that time, a copy will be forwarded to your office for review.

The purpose of this letter is to introduce your office to the LTF program and to initiate early consultation. It is USASMDC's desire to ensure that any concerns you might have about our efforts to identify historic properties and assess potential impacts are addressed early in the LTF planning process. If you have any questions or concerns about the LTF project, please contact Commander, U.S. Army Space and Missile Defense Command, Attention: SMDC-EN-V (Mr. Thomas Craven), P.O. Box 1500, Huntsville, Alabama 35807-3801. Mr. Craven can also be reached at (256) 955-1533.

Sincerely,

Daniel W. Mc Cauley
Acting Deputy Chief of Staff,
Engineer

Enclosures

Copies Furnished:

Director, Ballistic Missile Defense Organization, ATTN: TOT, 7100 Defense Pentagon, Washington, DC 20301-7100

Ms. Ginger Crawford, Environmental Planning, 45 CES/CEVP, 1224 Jupiter Street, Patrick Air Force Base, Florida 32925-3343

Mr. Mario Busacca, National Aeronautical Space Administration/Kennedy Space Center, Mail Code: JJ-D, Kennedy Space Center, Florida 32899

Mr. Mike McNeely, Mason Technologies, Inc., Stennis Space Center, Mississippi 39529-7099

Commander, U.S. Army Aviation and Missile Command, ATTN: AMSAM-RA-EMP (Mike Hubbard), Redstone Arsenal, Alabama 35898-5300

Mr. Ron Magee, National Aeronautical Space Administration, Building 1100, Room 3012-B, Stennis Space Center, Mississippi 39529

DEPARTMENT OF THE ARMY
[illegible]

REPLY TO ATTENTION OF

0 2 JUL 1998

SMDC-EN-V READING FILE

Environmental Division

Mr. George W. Percy
Division of Historical Resources
Department of State
R.A. Gray Building, 500 South Bronough Street
Tallahassee, Florida 32399-0250

Dear Mr. Percy:

The Ballistic Missile Defense Organization (BMDO) is currently conducting a laser research program aimed at developing technology for directed energy activities for ballistic missile defense that has global capability. For your information, a description of that program is enclosed. One of the first steps in that program is testing of the technology and concepts. To that end, BMDO is considering the construction of a high-energy laser test facility (LTF).

The BMDO tasked the U.S. Army Space and Missile Defense Command (USASMDC) to prepare an Environmental Assessment (EA) for the construction of this high-energy LTF. Kennedy Space Center, Florida and Cape Canaveral Air Station, Florida are two of four sites being considered to host this facility. Site maps for placement of the proposed facility at the sites in Florida are also enclosed. The facility will consist of a 6-hectare (15-acre) laser test complex surrounded by a 1.2-kilometer (0.75-mile) radius safety zone; and a 10-hectare (25-acre) campus-type support complex located outside the safety zone. Ground disturbance will occur from the construction of new facilities and utilities and some existing buildings and structures may require modification.

The EA team is currently in the process of collecting information related to archeological, historical, and traditional resources within the area of potential effect and conducting analysis to determine if there will be any effects as a result of the LTF program. We are working closely with the installations' cultural resources managers to ensure that all historic properties are identified. As soon as our data collection and analysis are complete, we will contact your office for a review

of our determination of effect. The draft EA is scheduled for distribution to various agencies and the public in early 1999. At that time, a copy will be forwarded to your office for review.

The purpose of this letter is to introduce your office to the LTF program and to initiate early consultation. It is USASMDC's desire to ensure that any concerns you might have about our efforts to identify historic properties and assess potential impacts are addressed early in the LTF planning process. If you have any questions or concerns about the LTF project, please contact Commander, U.S. Army Space and Missile Defense Command, Attention: SMDC-EN-V (Mr. Thomas Craven), P.O. Box 1500, Huntsville, Alabama 35807-3801. Mr. Craven can also be reached at (256) 955-1533.

Sincerely,

Daniel W. Mc Cauley
Acting Deputy Chief of Staff,
Engineer

Enclosures

Copies Furnished:

Director, Ballistic Missile Defense Organization,
ATTN: TOT, 7100 Defense Pentagon, Washington,
DC 20301-7100

Ms. Ginger Crawford, Environmental Planning,
45 CES/CEVP, 1224 Jupiter Street, Patrick Air Force Base,
Florida 32925-3343

Mr. Mario Busacca, National Aeronautical Space
Administration/Kennedy Space Center,
Mail Code: JJ-D, Kennedy Space Center, Florida 32899

Mr. Mike McNeely, Mason Technologies, Inc., Stennis Space Center,
Mississippi 39529-7099

Commander, U.S. Army Aviation and Missile Command, ATTN: AMSAM-RA-EMP (Mike Hubbard), Redstone Arsenal, Alabama 35898-5300

Mr. Ron Magee, National Aeronautical Space Administration,
Building 1100, Room 3012-B, Stennis Space Center, Mississippi
39529

DEPARTMENT OF THE ARMY
[illegible]
[illegible]
[illegible]

REPLY TO
ATTENTION OF

Environmental Division

Mr. Elbert Hilliard
Mississippi Department of Archives and History
P.O. Box 571
Jackson, Mississippi 39205-0571

Dear Mr. Hilliard:

The Ballistic Missile Defense Organization (BMDO) is currently conducting a laser research program aimed at developing technology for directed energy activities for ballistic missile defense that has global capability. For your information, a description of that program is enclosed. One of the first steps in that program is testing of the technology and concepts. To that end, BMDO is considering the construction of a high-energy laser test facility (LTF).

The BMDO tasked the U.S. Army Space and Missile Defense Command (USASMDC) to prepare an Environmental Assessment (EA) for the construction of this high-energy LTF. Stennis Space Center, Mississippi is one of four sites being considered to host this facility. The site map for placement of the proposed facility at the site in Mississippi is enclosed. The facility will consist of a 6-hectare (15-acre) laser test complex surrounded by a 1.2-kilometer (0.75-mile) radius safety zone; and a 10-hectare (25-acre) campus-type support complex located outside the safety zone. Ground disturbance will occur from the construction of new facilities and utilities and some existing buildings and structures may require modification.

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The purpose of this letter is to introduce your office to the LTF program and to initiate early consultation. It is USASMDC's desire to ensure that any concerns you might have about our efforts to identify historic properties and assess potential impacts are addressed early in the LTF planning process. If you have any questions or concerns about the LTF project, please contact Commander, U.S. Army Space and Missile Defense Command, Attention: SMDC-EN-V (Mr. Thomas Craven), P.O. Box 1500, Huntsville, Alabama 35807-3801. Mr. Craven can also be reached at (256) 955-1533.

Sincerely,

Daniel W. Mc Cauley
Acting Deputy Chief of Staff,
Engineer

Enclosures

Copies Furnished:

Director, Ballistic Missile Defense Organization, ATTN: TOT, 7100 Defense Pentagon, Washington, DC 20301-7100
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Mr. Mario Busacca, National Aeronautical Space Administration/Kennedy Space Center, Mail Code: JJ-D, Kennedy Space Center, Florida 32899
Mr. Mike McNeely, Mason Technologies, Inc., Stennis Space Center, Mississippi 39529-7099
Commander, U.S. Army Aviation and Missile Command, ATTN: AMSAM-RA-EMP (Mike Hubbard), Redstone Arsenal, Alabama 35898-5300
Mr. Ron Magee, National Aeronautical Space Administration, Building 1100, Room 3012-B, Stennis Space Center, Mississippi 39529

Mississippi Department of Archives and History

Historic Preservation Division • Post Office Box 571 • Jackson, Mississippi 39205-0571
Telephone 601-359-6940 • Fax 601-359-6955

Established 1902

MEMORANDUM

Date: July 8, 1998

To: Mr. Daniel W. McCauley
Acting Deputy Chief of Staff, Engineer
Department of the Army
U.S. Army Space and Missile Defense Command
P. O. Box 1500
Huntsville, Alabama 35807-3801

From: Roger G. Walker, RGW Review and Compliance Officer
Mississippi Department of Archives and History

RE: Ballistic Missile Defense Organization's proposed construction of a high-energy laser test facility

We are in receipt of your July 2, 1998, letter, in which you indicated that Stennis Space Center in Hancock County, Mississippi, is one of four sites being considered to host the above referenced facility. We appreciate your early consultation in this matter.

Our records indicate that portions of the Stennis Space Center were surveyed by the Mobile District, Corps of Engineers, for MDAH cultural resource survey report #88-082 and that a portion of said survey lies within the Safety Zone and the Stennis Space Center Boundary depicted on the LTF Site Location Map. No cultural resources have been recorded within the areas depicted on said map.

We look forward to receiving a copy of the draft Environmental Assessment. Your continued cooperation is appreciated.

cc: Clearinghouse for Federal Programs

United States Department of the Interior

FISH AND WILDLIFE SERVICE
6620 Southpoint Drive South
Suite 310
Jacksonville, Florida 32216-0912

IN REPLY REFER TO:
FWS/R4/ES-JAFL

JUL 21 1998

Commander
U.S. Army Space and Missile Defense Command
SMDC-EN-V (Mr. Thomas M. Craven)
P.O. Box 1500
Huntsville, Alabama 35807-3801

RE: Comments on Federal Threatened and Endangered Species List for National Environmental Policy Act Compliance on Proposed Space Based Laser Readiness Demonstrator Laser Test Facility (FWS Log No: 98-706E)

Dear Mr Craven:

As requested in a letter dated July 2, 1998, our office has reviewed your lists of federally threatened, endangered or candidate species occurring or potentially occurring at two possible SBLRD LTF site locations: Kennedy Space Center and Cape Canaveral Air Station, Florida. Based on your specific site information, we recommend you modify the lists as follows:

Kennedy Space Center - Delete piping plover (*Charadrius melodus*), red-cockaded woodpecker (*Picoides borealis*), roseate tern (*Sterna dougallii*), Florida panther (*Felis concolor coryi*) and Southeastern beach mouse (*Peromyscus polionotus niveiventris*).

Cape Canaveral Air Station - Delete "C" from Federal status for the gopher frog (*Rana capito*).

If you have additional inquiries, please contact Mr. John Milio in this office (904) 232-2580, X112..

Sincerely,

for Michael M. Bentzien
Assistant Field Supervisor

Post-it™ Fax Note 7671	Date 7/22/98	# of pages ▶ 1
To Rachel Jordan	From T. Craven	
Co./Dept. EDAW	Co. SMDC-EN-V	
Phone # 430-5560	Phone # 955-1533	
Fax # 430-5561	Fax # 955-5074	

United States Department of the Interior

FISH AND WILDLIFE SERVICE
2001-A Highway 98
P. O. Drawer 1190
Daphne, Alabama 36526

IN REPLY REFER TO:
98-1209a

July 28, 1998

Commander
U.S. Army Space and Missile Defense Command
Attention: SMDC-EN-V (Mr. Thomas M. Craven)
P.O. Box 1500
Huntsville, AL 35807-3801

Dear Commander:

Thank you for your letter, dated July 2, 1998, concerning the Environmental Assessment being prepared in support of the construction of a high energy laser test facility for a Laser Readiness Demonstrator. We have reviewed the information and are providing the following comments in accordance with the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.).

We concur with your list of federally protected species that may occur at the Redstone Arsenal, Alabama and the Stennis Space Center, Mississippi candidate locations.

If you have any questions or need additional information, please contact Patric Harper at (334) 441-5181 ext. 34.

Sincerely,

Carl Couret
Acting Field Supervisor

[redacted]

FLORIDA DEPARTMENT OF STATE
Office of the Secretary
Office of International Relations
Division of Administrative Services
Division of Corporations
Division of Cultural Affairs

MEMBER OF THE FLORIDA CABINET
Division of Library & Information Services
Division of Historical Resources
Ringling Museum of Art
Division of Licensing
Division of Elections

FLORIDA DEPARTMENT OF STATE
Sandra B. Mortham
Secretary of State
DIVISION OF HISTORICAL RESOURCES

September 18, 1998

Mr. Daniel W. McCauley
Environmental Division
Department of the Army
U.S. Army Space and Missile Defense Command
P. O. Box 1500
Huntsville, Alabama 35807-3801

In Reply Refer To:
Robin D. Jackson
Historic Sites Specialist
Project File No. 985145

RE: Cultural Resource Assessment Request
Preparation of Environmental Assessment for Construction of High-energy Laser Test Facility - Possible Location Sites at Kennedy Space Center and Cape Canaveral Air Station
Brevard County, Florida

Dear Mr. McCauley:

In accordance with the procedures contained in 36 C.F.R., Part 800 ("Protection of Historic Properties"), we have reviewed the referenced project(s) for possible impact to historic properties listed, or eligible for listing, in the National Register of Historic Places. The authority for this procedure is the National Historic Preservation Act of 1966 (Public Law 89-665), as amended.

Thank you for sending the above referenced document. We look forward to coordinating with your office on this project. If you have any questions concerning our comments, please do not hesitate to contact us. Your interest in protecting Florida's historic properties is appreciated.

Sincerely,

Laura A. Kammerer

for George W. Percy, Director
Division of Historical Resources
and
State Historic Preservation Officer

GWP/Jrj

DIRECTOR'S OFFICE
R.A. Gray Building • 500 South Bronough Street • Tallahassee, Florida 32399-0250 • (850) 488-1480
FAX: (850) 488-3353 • WWW Address http://www.dos.state.fl.us

❒ ARCHAEOLOGICAL RESEARCH (850) 487-2299 • FAX: 414-2207
☑ HISTORIC PRESERVATION (850) 487-2333 • FAX: 922-0496
❒ HISTORICAL MUSEUMS (850) 488-1484 • FAX: 921-2503

Established 1902

Mississippi Department of Archives and History

Historic Preservation Division • Post Office Box 571 • Jackson, Mississippi 39205-0571
Telephone 601-359-6940 • Fax 601-359-6955

September 21, 1998

Mr. Wayne Gouguet
Mason Technologies, Inc.
Building 9100, SAAP Industrial Center
Stennis Space Center, Mississippi 39529-7099

Dear Mr. Gouguet:

RE: Two tracts of land at the Stennis Space Center: Tract 1 of 12-14 acres in Sec. 28, T7S, R16W, and Tract 2 of 20-23 acres in Sec. 32, T7S, R16W, Hancock County (98-201)

We have reviewed the September 16, 1998, cultural resources survey report of Archaeology Mississippi for the above referenced undertaking. No properties listed in or eligible for listing in the National Register of Historic Places will be affected. We, therefore, have no further reservations with this undertaking.

There remains a very remote possibility that unrecorded cultural resources may be encountered during construction. If this occurs, we would appreciate your contacting this office immediately in order that we may offer appropriate comments under 36 CFR 800.11 within forty-eight hours. Your continued cooperation is appreciated.

Sincerely,

Elbert R. Hilliard
State Historic Preservation Officer

Roger G. Walker

By: Roger G. Walker
Review and Compliance Officer

cc: Clearinghouse for Federal Programs

Archaeology Mississippi, Inc.

James Lauro

Cultural Resources Management

CULTURAL RESOURCE SURVEY

OF TWO TRACTS OF LAND

HANCOCK COUNTY, MS

JAMES LAURO
ARCHAEOLOGIST
SEPTEMBER 16, 1998

PREPARED FOR:

MASON TECHNOLOGIES, INC.
ATTN: MR. WAYNE GOUGUET
BUILDING 9100
SAAP INDUSTRIAL CENTER
JOHN C. STENNIS SPACE CENTER,
MISSISSIPPI 39529-7099

3935 I-55 South
Jackson, MS 39212

601-373-8002
FAX 601-371-1918

CULTURAL RESOURCE SURVEY

OF TWO TRACTS OF LAND

HANCOCK COUNTY, MISSISSIPPI

At the request of Mr. Wayne Gouguet of Mason Technologies, Inc., John C. Stennis Space Center, Mississippi, a cultural resources survey was conduced by Archaeology Mississippi, Inc. in Hancock County, Mississippi. The areas surveyed are two tracts of land located in the John C. Stennis Space Center. Tract 1 is located in Section 28, Township 7 South, Range 16 West (Dead Tiger Creek 7.5' topo map). Tract 1 is approximately 12-14 acres in size and Tract 2 is approximately 20-23 acres in size. The literature search, fieldwork, and report compilation were conducted by Jean Hartfield and James Lauro on September 10, 11, 12, 14, 15, and 16, 1998. Both tracts of land are located in areas with vegetation and trees, and surface visibility, from a cultural resources perspective, was generally poor.

A literature search was conducted at the Mississippi Department of Archives & History in Jackson, Mississippi. Previously conducted cultural resource surveys in the vicinity include 88-082 and 98-135. Previously recorded archaeological sites in the vicinity include Site 22HA627, a site which has been determined not eligible for the National Register of Historic Places.

A complete walk over survey of Tracts 1 and 2 was conducted with shovel tests (approximately 30 cm. across x 20-30 cm. deep) dug at approximately 25-30 meter intervals with approximately 25 meters between each survey transect. Approximately 70% of all shovel tests were screened through 1/4" mesh. No cultural resources of any kind were located during the survey. There are no standing structures of any type located either in Tract 1 or Tract 2.

A copy of this report has been submitted to the Review & Compliance Officer of the Mississippi Department of Archives & History in Jackson, Mississippi. If any cultural resources are uncovered that were not detected by this survey, please contact Archaeology Mississippi, Inc., directly. It is the opinion of Archaeology Mississippi, Inc. that this project be cleared from a cultural resources point of view, and no further archaeological investigations be conducted on either Tract 1 or Tract 2. We appreciate the opportunity to have worked on this important project.

James Lauro

James Lauro
Archaeologist

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO ATTENTION OF

Environmental Division

Dr. Gerald Miller
Office of Federal Programs
EPA Region IV
Atlanta Federal Center
100 Alabama Street SW
Atlanta, GA 30303-3104

Dear Dr. Miller:

In compliance with the National Environmental Policy Act (NEPA) and the Council on Environmental Quality regulations implementing NEPA the *Laser Test Facility Environmental Assessment* (EA) is being prepared by the U.S. Army Space and Missile Defense Command for the Ballistic Missile Defense Organization. The EA ealuates construction and operation of a new Laser Test Facility (LTF).

The EA describes and addresses the potential impacts of construction and operation of the LTF at four alternative locations: Redstone Arsenal (RSA), Alabama; Stennis Space Center, Mississippi; Kennedy Space Center Florida; and Cape Canaveral Air Station, Florida.

Please review the enclosed Coordinating Final LTF EA and provide written comments by December 8, 1999 to Mr. Thomas Craven SMDC-EN-V, U.S. Army Space and Missile Defense Command, P.O. Box 1500, Huntsville, Alabama, 35807-3801. If you have any questions regarding the LTF project, Mr. Craven can also be reached at (256) 955-1533.

Sincerely,

John L. Ramey
Lieutenant Colonel, U.S. Army
Deputy Chief of Staff,
Engineer

Enclosure

Copies Furnished:

Director, Test and Engineering Resources, ATTN: BMDO-DET (Mr. Crate Spears), 1725 Jefferson Davis Highway, CS2, Suite 809, Arlington, VA 22202-4102

2Lt. Angela Spaith, U.S. Air Force Space and Missile Systems Center, Engagement Systems Division, 2420 Vela Way, Suite 1467-80, Los Angeles Air Force Base, El Segundo, CA 90245-4659

Commanding General, U.S. Army Aviation and Missile Command, ATTN: AMSAM-RA-EMT-IR (Mr. Whitt Walker), Redstone Arsenal, AL 35898-5340

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF

Environmental Division

Florida Department of Community Affairs
Attention: Ms. Cherie Trainor
Florida State Clearinghouse
2555 Shumard Oak Blvd.
Tallahassee, FL 32399-2100

Dear Ms. Trainor:

In compliance with the National Environmental Policy Act (NEPA) and the Council on Environmental Quality regulations implementing NEPA the *Laser Test Facility Environmental Assessment* (EA) is being prepared by the U.S. Army Space and Missile Defense Command for the Ballistic Missile Defense Organization. The EA evaluates construction and operation of a new Laser Test Facility (LTF).

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Sincerely,

John L. Ramey
Lieutenant Colonel, U.S. Army
Deputy Chief of Staff,
Engineer

Enclosure

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Mr. Mario Busacca, Kennedy Space Center, Mail Code: JJ-D, Mail Code: JJ-D, Kennedy Space Center, Florida 32899

45 Space CES/CEVP, ATTN: (Mr. Randall Rowland), 1224 Jupiter Street, MS: 9125, Patrick Air Force Base, FL 32925-3343

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF

Environmental Division

State of Mississippi Clearinghouse
for Federal Programs
Attention: Ms. Kathy Mallette
550 High Street
2000 Walter Sillers Building
Jackson, MS 39201

Dear Ms. Mallette:

In compliance with the National Environmental Policy Act (NEPA) and the Council on Environmental Quality regulations implementing NEPA the *Laser Test Facility Environmental Assessment* (EA) is being prepared by the U.S. Army Space and Missile Defense Command for the Ballistic Missile Defense Organization. The EA evaluates construction and operation of a new Laser Test Facility (LTF).

The EA describes and addresses the potential impacts of construction and operation of the LTF at four alternative locations: Redstone Arsenal, Alabama; Stennis Space Center, Mississippi; Kennedy Space Center Florida; and Cape Canaveral Air Station, Florida.

Please review the enclosed Coordinating Final LTF EA and provide written comments by December 8, 1999 to Mr. Thomas Craven SMDC-EN-V, U.S. Army Space and Missile Defense Command, P.O. Box 1500, Huntsville, Alabama, 35807-3801. If you have any questions regarding the LTF project, Mr. Craven can also be reached at (256) 955-1533.

Sincerely,

John L. Ramey
Lieutenant Colonel, U.S. Army
Deputy Chief of Staff,
Engineer

Enclosure

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Director, Test and Engineering Resources, ATTN: BMDO-DET (Mr. Crate Spears), 1725 Jefferson Davis Highway, CS2, Suite 809, Arlington, VA 22202-4102

2Lt. Angela Spaith, U.S. Air Force Space and Missile Systems Center, Engagement Systems Division, 2420 Vela Way, Suite 1467-80, Los Angeles Air Force Base, El Segundo, CA 90245-4659

Mr. Ronald G. Magee, National Aeronautical Space Administration, Building 110, Room 3012-B, Stennis Space Center, MS 39529

Mr. John Cecconi, Mississippi Army Ammunition Plant, SIOMS-CR-Bldg 9100, Stennis Space Center, MS 39529-7000

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF
Environmental Division

Mr.Larry E. Goldman
Field Supervisor
U.S. Fish and Wildlife Service
P.O. Drawer 1190
Daphne, AL 36526

Dear Mr. Goldman:

In compliance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality regulations implementing NEPA, and Section 7 of the Endangered Species Act, the *Laser Test Facility Environmental Assessment* (EA) is being prepared by the U.S. Army Space and Missile Defense Command for the Ballistic Missile Defense Organization. The EA supports construction and operation of a new Laser Test Facility (LTF). A copy of the Coordinating Final EA is included for your review and comment. Location maps of the potential sites in Alabama and Mississippi are enclosed. Also enclosed are tables of threatened and endangered species that potentially occur in the vicinity.

As described in our earlier letter dated July 2, 1998, the LTF is a facility necessary to demonstrate the readiness of Space Based Laser technology. The LTF is needed because no existing test facility has the required combination of capabilities, such as the management of a high energy, large cross-section laser beam, that would allow this scale of demonstration testing.

The EA describes and addresses the potential environmental impacts of construction and operation of the LTF at four alternative locations: Redstone Arsenal (RSA), Alabama; the Mississippi Army Ammunition Plant (MSAAP) located within the Stennis Space Center, Mississippi; Kennedy Space Center, Florida; and Cape Canaveral Air Station, Florida.

The LTF would consist of a Performance Test Chamber Complex built on approximately 6 hectares (15 acres) and a 4-hectare (10-acre) construction lay down area. A 1.2-kilometer (0.75-mile) radius safety zone would surround this complex to enclose the area that could potentially be affected by accidents with the laser reactants. An Integration and Test Complex would occupy approximately 10 hectares (25 acres) outside the safety zone.

The following paragraphs summarize the potential impacts to biological resources on Redstone Arsenal and Stennis Space Center as identified in the LTF EA.

Redstone Arsenal - Construction of the LTF would disturb approximately 10 hectares (25 acres) of pine-forested land in the southern portion of Redstone Arsenal. The area represents less than 1 percent of the pine stands on the Arsenal. The area surrounding Building 8027 is a previously disturbed area along Buxton Road that is maintained by mowing. Although removal of vegetation at the proposed LTF sites would displace wildlife, it would not result in a substantial reduction in habitat available for wildlife in the area. No threatened or endangered plant species have been identified within or adjacent to the project areas.

Construction activities could disturb nesting, hatching, and fledging of land and shorebirds; however, no listed bird species have been identified as nesting on the Arsenal. The likelihood that transient bald eagles would be adversely affected by construction activities is anticipated to be slight. No impacts to wetlands are anticipated.

Noise levels from tests of the laser system would be approximately 125 decibels (dB) at about 15 meters (50 feet) from the source. The noise would attenuate to approximately 93 dB at a distance of 600 meters (1,968 feet) assuming no intervening structures or vegetation. Wildlife within this area could potentially be affected by the noise. The level of noise is expected to have a minimal effect on wildlife for the following reasons. Birds, including eagles and other raptors, that regularly use habitats on the Arsenal already experience periodic episodes of loud noise from jet aircraft flying nearby and rocket testing and may not react strongly to this short-term test event. It is likely that human activity prior to testing would cause birds and other mobile species of wildlife to leave the area before the test, thus reducing the number of individuals that could be exposed to the loudest noise levels. Only 16 tests per year are anticipated. The noise levels would return to near ambient levels within 120 to 200 seconds.

The chemical of concern in the laser reaction exhaust stream is hydrogen fluoride, a hazardous air pollutant. Each test run would result in the release of no more than 9.5 kilograms (21 pounds) of hydrogen fluoride. The hydrogen fluoride would be ejected along with approximately 68,000 liters (15,000 gallons) of water as steam. Modeling the emission of 9.5 kilograms (21 -

pounds) of hydrogen fluoride as an instantaneous particulate release using the TSCREEN/PUFF model indicates a maximum concentration of 0.006271 grams per cubic meter (7.6 parts per million [ppm]). This model does not account for positive buoyancy and in reality the cloud would likely travel further, expand more, and deposit less concentration in any given area.

During periods when the relative humidity is below 100 percent, minor deposition of hydrogen fluoride is expected; however, during periods of high humidity, hydrogen fluoride may attach to water droplets resulting in the deposition of hydrogen fluoride onto nearby ground and water surfaces. Depending on the buffering capacity of the receiving water, the deposition of hydrogen fluoride may result in an increase in surface water acidity. The degree and duration of any increased acidity in surface waters would depend on several variables, including the buffering capacity (alkalinity) of the surface water.

If the maximum concentration of hydrogen fluoride (7.6 ppm) were deposited on a square meter (11 square feet) of pure water with a pH of 7, and reacted only with the first 15 centimeters (6 inches), it would result in a pH reduction down to approximately 5.6. However, specific reductions of the pH of a body of water depends on the current pH and water content (i.e., salts or minerals dissolved). Chemicals naturally present in the water would tend to buffer the original pH and lessen any pH reduction due to hydrogen fluoride. These naturally occurring chemicals would also speed the area's recovery. Marshes and slow-moving surface waters, indicative of low mixing rates, would tend to dilute the acid more slowly than a similar water body with a higher mixing rate due to wave action or rapid currents. In any case, the initial deposition of hydrogen fluoride would be in a limited area and the period of time between tests is likely to be 2-3 weeks.

Surface waters near the Arsenal are slightly acidic to alkaline. Average pH levels range from a low of 6.9 along portions of McDonald Creek to a high of nearly 7.4 along Indian Creek. Due to the natural buffering capacity of nearby surface waters, the deposition of small amounts of hydrogen fluoride are anticipated to result in only minor and temporary decreases in water pH. Small amounts of hydrogen fluoride deposited on water surfaces would quickly dissipate due to surface water mixing and the natural buffering capacity of the surface waters. No long term adverse impacts to aquatic species are expected.

According to the Material Safety Data Sheet, death occurred in fifty percent of rats exposed to inhalation of 1,276 ppm of hydrogen fluoride for 1 hour. In a 1934 study on the toxicity effects of hydrogen fluoride on animals, no deaths occurred in animals exposed to 1,200 ppm of hydrogen fluoride for 30 minutes. Concentrations below 120 ppm were tolerated for 5 hours with no deaths by rabbits and guinea pigs. The estimated maximum ground level concentration of hydrogen fluoride within a cubic meter is predicted to be 7.6 ppm. The length of exposure to the hydrogen fluoride cloud is anticipated to be less than 5 minutes, which further reduces actual impacts. No adverse effects to wildlife species, such as birds flying through the steam and hydrogen fluoride cloud, are expected as a result of this level of hydrogen fluoride emission.

Accidental releases of hazardous materials due to transfer operations would probably be limited to a few ounces of reactant, which would be dispersed before reaching the edge of the safety area. However, the potential does exist for a serious mishap involving the release of a larger portion of a stored reactant. As such, meteorological monitoring and dispersion modeling would be carried out before initiating any transfer operations. The facility's Risk Management Plan would include steps to be taken in order to minimize the impact such an accidental release could have on people and on the environment.

Stennis Space Center - The LTF would be constructed within the MSAAP located in the northern portion of Stennis Space Center. Land in the area is managed for commercial tree harvest and timber is harvested on a regular basis in accordance with the Natural Resources Management Plan. No threatened or endangered plant species have been identified on the MSAAP installation. Several wetland mitigation areas have been established on Stennis Space Center that could be used to compensate for filling wetlands during construction activities.

No adverse impacts to wildlife have been identified as a result of prior operations on the installation and no threatened or endangered wildlife species are known to actually reside on the installation. Impacts to wildlife as a result of operation of the LTF would be similar to those anticipated at Redstone Arsenal.

Surface waters in the vicinity of the proposed LTF are slightly acidic to alkaline in nature. Average surface water pH levels range from a low of 6.1 in nearby freshwater streams to a high of nearly 8.0 in the access canal. Because emissions of

hydrogen fluoride are expected to be minor and intermittent in nature, only slight and temporary reductions in the pH values of surface waters as discussed above for Redstone Arsenal are anticipated.

The purpose of this letter is to continue the Section 7 consultation initiated with our earlier correspondence. It is the U.S. Army Space and Missile Defense Command's desire to ensure that any concerns that you may have about our efforts to identify sensitive biological resources and assess potential impacts are addressed. In order to complete the NEPA process, we are requesting review and concurrence on the Coordinating Final LTF EA and Section 7 concurrence of "no effect." Please provide written comments by 8 December 1999 to Commander, U.S. Army Space and Missile Defense Command, Attention: SMDC-EN-V (Mr. Thomas M. Craven), P.O. Box 1500, Huntsville, AL 35807-3801 or by data facsimile (256) 955-5074. If you have any questions, you can also contact Mr. Craven at (256) 955-1533.

Sincerely,

JLR

John L. Ramey
Lieutenant Colonel, U.S. Army
Deputy Chief of Staff,
Engineer

Enclosures

Copies Furnished:

Director, Test and Engineering Resources, ATTN: BMDO-DET (Mr. Crate Spears), 1725 Jefferson Davis Highway, CS2, Suite 809, Arlington, VA 22202-4102

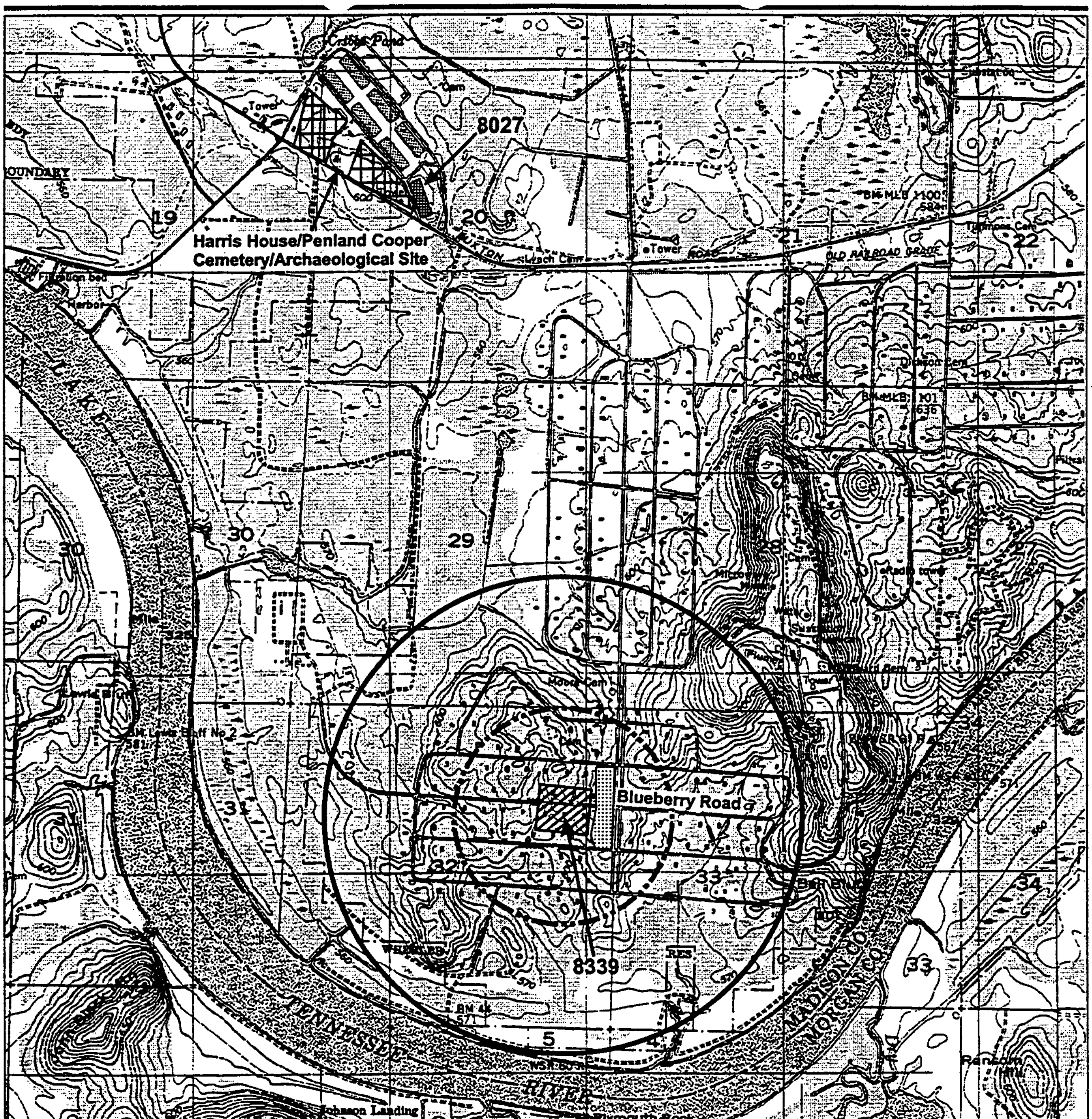
2Lt. Angela Spaith, U.S. Air Force Space and Missile Systems Center, Engagement Systems Division, 2420 Vela Way, Suite 1467-80, Los Angeles Air Force Base, El Segundo, CA 90245-4659

Commanding General, U.S. Army Aviation and Missile Command, ATTN: AMSAM-RA-EMT-IR (Mr. Whitt Walker), Redstone Arsenal, AL 35898-5340

Mr. Ronald G. Magee, National Aeronautical Space Administration, Building 110, Room 3012-B, Stennis Space Center, MS 39529

Mr. John Cecconi, Mississippi Army Ammunition Plant, SIOMS-CR-Bldg 9100, Stennis Space Center, MS 39529-7000

Attachment 1



EXPLANATION

- ESQD 549 meters (1,800 feet)
- Safety Zone 1,207 meters (3,960 feet)
- Redstone Arsenal Boundary
- PTC Complex
- I&T Complex
- Facilities Available for LTF
- Temporary Construction Laydown Area

PTC - Performance Test Chamber
I&T - Integration and Test

Scale 1:30,000

0 381 762 Meters

0 1,250 2,500 Feet

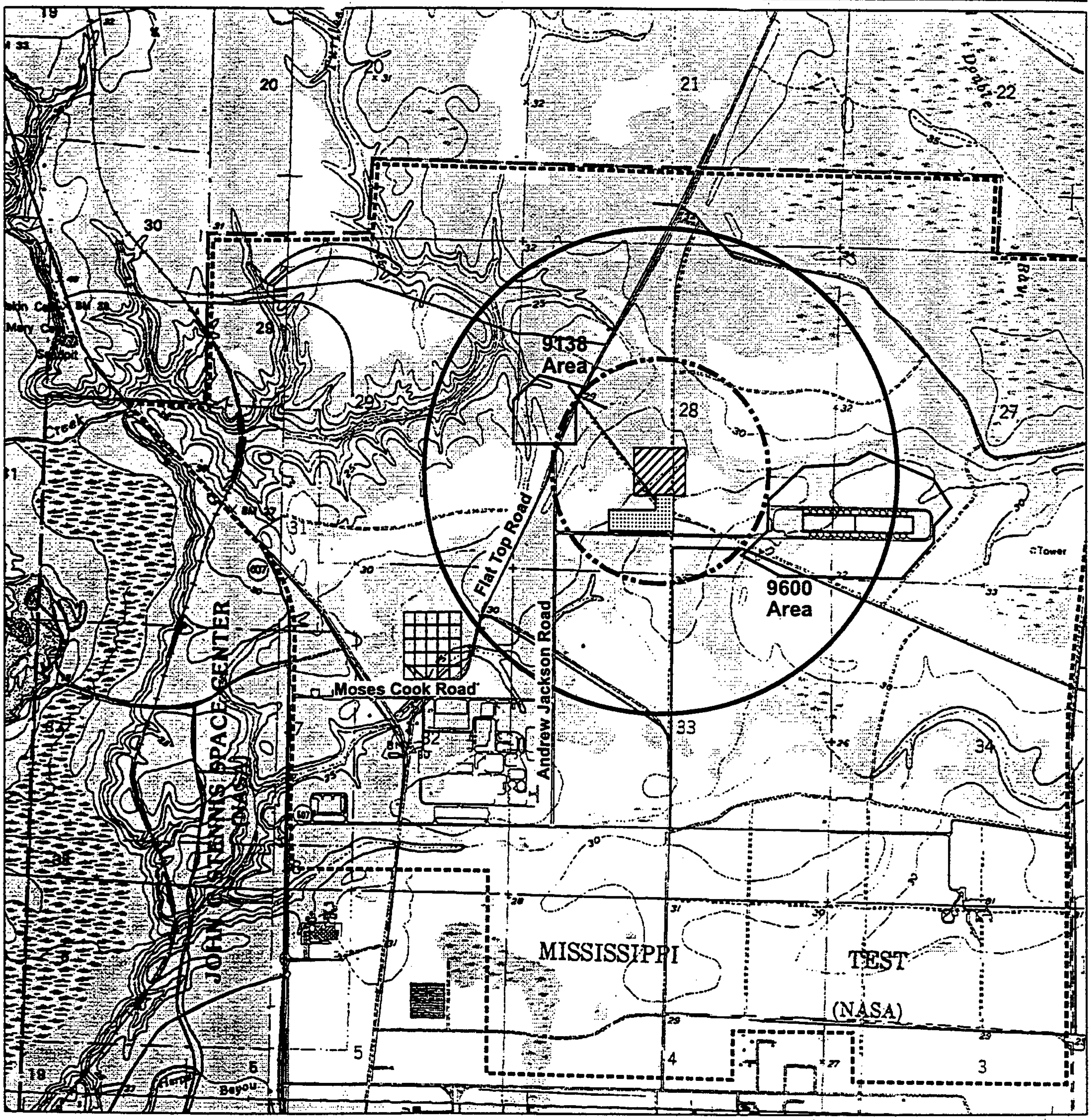
NORTH

0017M

LTF Site Location Map

Redstone Arsenal, Alabama

Attachment 2



EXPLANATION

- ESQD 549 meters (1,800 feet)
- Safety Zone 1,207 meters (3,960 feet)
- Stennis Space Center Boundary
- Mississippi Army Ammunition Plant Boundary
- PTC Complex
- I&T Complex
- Temporary Construction Laydown Area

PTC - Performance Test Chamber
I&T - Integration and Test

Scale 1:30,000

0 381 762 Meters

0 1250 2500 Feet

NORTH

LTF Site Location Map

Stennis Space Center, Mississippi

0028

Table 1: Species with Federal or State Status Potentially Occurring at Redstone Arsenal

Scientific Name	Common Name	Status State	Status Federal
Plants			
Apios priceana	Price's potato-bean	-	T
Clematis morefieldii	Morefield's leather flower	-	E
Marshallia mohrii	Mohr's Barbara's buttons	-	T
Xyris tennesseensis	Tennessee yellow-eyed grass	-	E
Crustaceans			
Palaemonaias alabamae	Alabama cave shrimp	SP	E
Reptiles and Amphibians			
Alligator mississippiensis	American alligator	SSC	T (S/A)
Birds			
Haliaeetus leucocephalus	Bald eagle	SP	T
Picoides borealis	Red-cockaded woodpecker	-	E
Mammals			
Felis concolor couguar	Eastern cougar	-	E
Myotis grisescens	Gray bat	SP	E
Myotis sodalis	Indiana bat	SP	E

– Not listed
SP State Protected
E Endangered
T Threatened
(S/A) Listed by similarity of appearance to a listed species

Table 2: Species with Federal or State Status Potentially Occurring at Stennis Space Center

Scientific Name	Common Name	Status	
		State	Federal
Plants			
Isoetes louisianensis	Louisiana quillwort [1]	S1	E
Fish			
Acipenser oxyrhynchus desotoi	Gulf sturgeon	E	T
Reptiles and Amphibians			
Alligator mississippiensis	American alligator	–	T (S/A)
Drymarchon corais couperi	Eastern indigo snake	T	E
Gopheus polyphemus	Gopher tortoise	E	T
Birds			
Grus canadensis pulla	Mississippi sandhill crane	E	E
Haliaeetus leucocephalus	Bald eagle	E	T
Pelecanus occidentalis	Brown pelican	E	E
Picoides borealis	Red-cockaded woodpecker	E	E
Mammals			
Felis concolor coryi	Florida panther	E	E
Ursus americanus luteolus	Louisiana black bear	E	T

Source: Stennis Space Center, 1997a

(1) Found in surrounding counties
– Not listed
S1 Critically imperiled because of extreme rarity (5 or fewer occurrences) or vulnerable to extirpation
E Endangered
T Threatened

DEPARTMENT OF THE AI...IY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF
Environmental Division

Michael M. Bentzien
Acting Field Supervisor
U.S. Fish and Wildlife Service
6620 Southpoint Dr. S
Suite 310
Jacksonville, FL 32216

Dear Mr. Bentzien:

In compliance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality regulations implementing NEPA, and Section 7 of the Endangered Species Act, the *Laser Test Facility Environmental Assessment* (EA) is being prepared by the U.S. Army Space and Missile Defense Command for the Ballistic Missile Defense Organization. The EA supports construction and operation of a new Laser Test Facility (LTF). A copy of the Coordinating Final EA is included for your review and comment. A location map of the potential sites on Kennedy Sapce Center, Florida is enclosed. Also enclosed is a table of threatened and endangered species that potentially occur in the vicinity. Your office will also be receiving a letter from the U.S. Air Force requesting consultation for this same action specifically on Cape Canaveral Air Station, Florida.

As described in our earlier letter, July 2, 1998, the LTF is a facility necessary to demonstrate the readiness of Space Based Laser technology. The LTF is needed because no existing test facility has the required combination of capabilities, such as the chamber size and management of a high energy, large cross-section laser beam, that would allow this scale of demonstration testing.

The EA describes and addresses the potential environmental impacts of construction and operation of the LTF at four alternative locations: Cape Canaveral Air Station (AS), Florida; Kennedy Space Center (KSC), Florida; Redstone Arsenal, Alabama; and Stennis Space Center, Mississippi.

The LTF would consist of a Performance Test Chamber Complex built on approximately 6 hectares (15 acres) and a 4-hectare (10-acre) construction lay down area. A 1.2-kilometer (0.75-mile) radius safety zone would surround this complex to enclose the area that could potentially be affected by accidents with the

laser reactants. An Integration and Test Complex would occupy approximately 10 hectares (25 acres) outside the safety zone.

The following paragraphs summarize the potential impacts to biological resources on KSC as identified in the LTF EA.

The Performance Test Chamber Complex would be constructed within an area mainly occupied by disturbed shrubs and open water. Vegetation at the Integration &Test Complex, to the southeast, is mainly scrub and slash pine and disturbed shrubs. Removal of vegetation at either location would not result in a substantial reduction in habitat available for wildlife in the area. Construction activities are not expected to affect threatened or endangered plant species. No primary Florida scrub jay habitat is located within the area that would be cleared or disturbed by construction activities. Secondary Florida scrub jay habitat is located adjacent to the proposed location for the Performance Test Chamber. The KSC Scrub Habitat Compensation Plan currently in place would be revised to address any vegetation impacts associated with clearing areas that could potentially be used by the Florida scrub jay.

Approximately 10 hectares (25 acres) of wetlands could potentially be disturbed by program activities. Construction activities after actual siting of the LTF would require application to the U.S. Army Corps of Engineers for review of Federal dredge and fill permitting requirements (referred to as wetlands resource permitting by the Florida Department of Environmental Protection). Any loss of jurisdictional wetlands would be mitigated, as required by appropriate permits. Mitigation measures could include replacement, protection, or restoration of wetlands. The permitting process would entail review of proposed activities and possible mitigation measures by all applicable parties and agencies.

Construction noise may disturb wildlife in the immediate vicinity during the construction period. Typically the noise at 15 meters (50 feet) from a construction site does not exceed an equivalent sound level of 90 A-weighted decibels. Most of the noise and human activity would be caused by truck traffic to and from the construction site and the use of heavy machinery and excavation equipment. If construction occurs during the winter months, wintering shorebirds may be disturbed. Construction activities could also disturb nesting, hatching, and fledging of land and shorebirds, sea turtles, and other wildlife in the area. No bald eagle nests occur in areas likely to be disturbed by construction activities. The combination of increased noise

levels and human activity would likely displace some small mammals and cause birds, including eagles or other listed bird species, that may be foraging in the area to temporarily avoid the area within approximately 15 meters (50 feet) of the site. Some wildlife may leave the area permanently, while others may likely become accustomed to the increased noise and human presence. Although the initial flushing would slightly increase the energy expenditure, additional foraging habitat occurs in the vicinity.

Noise levels from tests of the laser system would be approximately 125 decibels (dB) at about 15 meters (50 feet) from the source. The noise would attenuate to approximately 93 dB at a distance of 600 meters (1,968 feet) assuming no intervening structures or vegetation. Wildlife within this area could potentially be affected by the noise. Launch-related noise of similar magnitudes from Space Shuttle and Titan launches has not had a substantial effect on wildlife on or near the launch complexes. The test noise is expected to have a minimal effect on wildlife for the following reasons. Shorebirds, eagles, and other raptors that regularly use habitats on KSC already experience regular loud launch noise and may not react strongly to this short-term test event. It is likely that human activity prior to testing would cause birds and other mobile species of wildlife to leave the area before the test, thus reducing the number of individuals that could be exposed to the loudest noise levels. The proposed construction sites are located outside the minimum Florida recommended management zone boundaries (686 meters [2,250 feet] for known eagle nests. Studies of impacts to wildlife on KSC have not identified any productivity limiting response to launch noises. Bald eagles using a nest adjacent to the Kennedy Parkway have received episodic noise exposures of 102 dB. Response to such high noise has been short-term with no apparent substantial effects. Only 16 tests per year are anticipated. The noise levels would return to near ambient levels within 120 to 200 seconds.

The Performance Test Chamber Complex, Integration and Test Complex, and site operations (including the inhabited building explosive safety quantity-distance and Laser Safety Zone) may require specific planning zones, such as a hazardous operations zone, within the general support zone to allow for hazardous operations. This would be similar to the specific site planning zones established for the Industrial Area and the Vehicle Assembly Building Area. The Moore Creek cluster of impoundments would not be affected other than by restricted access within the Laser Safety Zone up to 16 times per year. Sensitivity of the

LTF to particulate contamination would be similar to other clean room facilities on KSC. Access to areas within the Laser Safety Zone would be restricted during laser fueling and testing activities. Coordination with personnel of KSC and Merritt Island National Wildlife Refuge would minimize any conflicts with the management of these areas for natural resources, controlled burning, or water level manipulation.

The chemical of concern in the laser reaction exhaust stream is hydrogen fluoride, a hazardous air pollutant. Each test run would result in the release of no more than 9.5 kilograms (21 pounds) of hydrogen fluoride. The hydrogen fluoride would be ejected along with approximately 68,000 liters (15,000 gallons) of water as steam. Modeling the emission of 9.5 kilograms (21 pounds) of hydrogen fluoride as an instantaneous particulate release using the TSCREEN/PUFF model indicates a maximum concentration of 0.006271 grams per cubic meter (7.6 parts per million [ppm]). This model does not account for positive buoyancy and in reality the cloud would likely travel further, expand more, and deposit less concentration in any given area.

During periods when the relative humidity is below 100 percent, minor deposition of hydrogen fluoride is expected; however, during periods of high humidity, hydrogen fluoride may attach to water droplets resulting in the deposition of hydrogen fluoride onto nearby ground and water surfaces. Depending on the buffering capacity of the receiving water, the deposition of hydrogen fluoride may result in an increase in surface water acidity. The degree and duration of any increased acidity in surface waters would depend on several variables, including the buffering capacity (alkalinity) of the surface water.

If the maximum concentration of hydrogen fluoride (7.6 ppm) were deposited on a square meter (11 square feet) of pure water with a pH of 7, and reacted only with the first 15 centimeters (6 inches), it would result in a pH reduction down to approximately 5.6. However, specific reductions of the pH of a body of water depends on the current pH and water content (i.e., salts or minerals dissolved). Chemicals naturally present in the water would tend to buffer the original pH and lessen any pH reduction due to hydrogen fluoride. These naturally occurring chemicals would also speed the area's recovery. Marshes and slow-moving surface waters, indicative of low mixing rates, would tend to dilute the acid more slowly than a similar water body with a higher mixing rate due to wave action or rapid currents. In any case, the initial deposition of hydrogen fluoride would be in a limited area and the period of time between tests is likely to be 2-3 weeks.

Surface waters near KSC are slightly acidic to alkaline. Average pH levels range from a low of approximately 6.9 in Banana River to a high of nearly 7.6 in Mosquito Lagoon. Due to the natural buffering capacity of nearby surface waters, the deposition of small amounts of hydrogen fluoride are anticipated to result in only minor and temporary decreases in water pH. Expected concentrations of hydrogen fluoride deposited on water surfaces would quickly dissipate due to surface water mixing and/or the natural buffering capacity of the surface waters. No long-term adverse impacts to aquatic species are expected.

According to the Material Safety Data Sheet, death occurred in fifty percent of rats exposed to inhalation of 1,276 ppm of hydrogen fluoride for 1 hour. In a 1934 study on the toxicity effects of hydrogen fluoride on animals, no deaths occurred in animals exposed to 1,200 ppm of hydrogen fluoride for 30 minutes. Concentrations below 120 ppm were tolerated for 5 hours with no deaths by rabbits and guinea pigs. The estimated maximum ground level concentration of hydrogen fluoride within a cubic meter is predicted to be 7.6 ppm. The length of exposure to the hydrogen fluoride cloud is anticipated to be less than 5 minutes, which further reduces actual impacts. No adverse effects to wildlife species, such as birds flying through the steam and hydrogen fluoride cloud, are expected as a result of this level of hydrogen fluoride emission.

Accidental releases of hazardous materials due to transfer operations would probably be limited to a few ounces of reactant, which would be dispersed before reaching the edge of the safety area. However, the potential does exist for a serious mishap involving the release of a larger portion of a stored reactant. As such, meteorological monitoring and dispersion modeling would be carried out before initiating any transfer operations. The facility's Risk Management Plan would include steps to be taken in order to minimize the impact such an accidental release could have on people and on the environment.

The purpose of this letter is to continue the Section 7 consultation initiated with our earlier correspondence. It is the U.S. Army Space and Missile Defense Command's desire to ensure that any concerns that you may have about our efforts to identify sensitive biological resources and assess potential impacts are addressed. In order to complete the NEPA process, we are requesting review and concurrence on the Coordinating Final LTF EA and Section 7 concurrence of "no effect." Please provide written comments by 8 December 1999 to Commander, U.S. Army Space and Missile Defense Command, Attention: SMDC-EN-V (Mr. Thomas M.

Craven), P.O. Box 1500, Huntsville, AL 35807-3801 or by data facsimile (256) 955-5074. An On Board Review of the EA is currently scheduled for 9-10 December 1999. If you have any questions, you can also contact Mr. Craven at (256) 955-1533.

Sincerely,

John L. Ramey
Lieutenant Colonel, U.S. Army
Deputy Chief of Staff,
Engineer

Enclosures

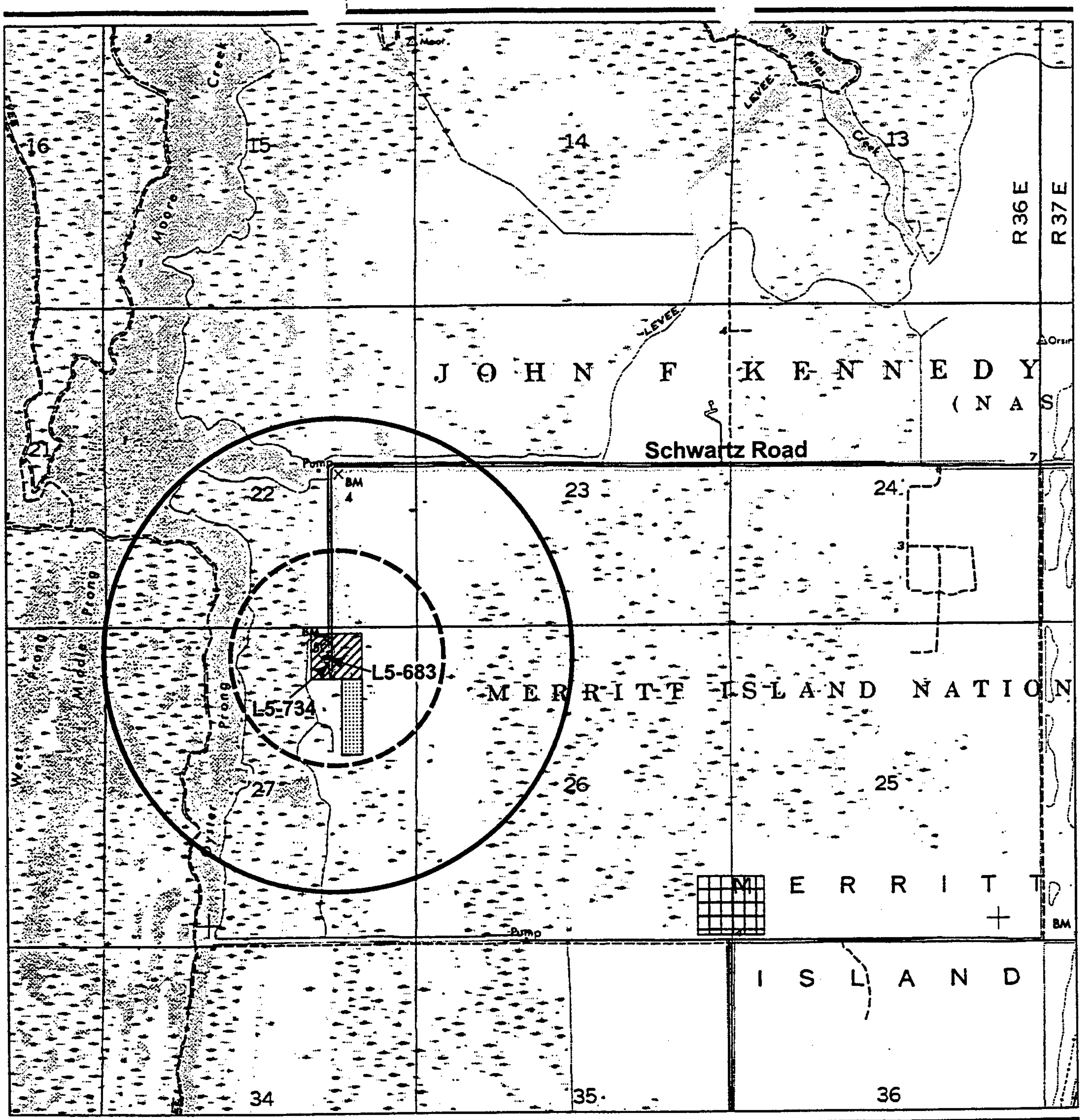
Copies Furnished:

Director, Test and Engineering Resources, ATTN: BMDO-DET (Mr. Crate Spears), 1725 Jefferson Davis Highway, CS2, Suite 809, Arlington, VA 22202-4102

2Lt. Angela Spaith, U.S. Air Force Space and Missile Systems Center, Engagement Systems Division, 2420 Vela Way, Suite 1467-80, Los Angeles Air Force Base, El Segundo, CA 90245-4659
39529-7000

Mr. Mario Busacca, Kennedy Space Center, Mail Code: JJ-D, Kennedy Space Center, Florida 32899

Attachment 1



EXPLANATION

- ESQD 549 meters (1,800 feet)
- Safety Zone 1,207 meters (3,960 feet)
- PTC Complex
- I&T Complex
- Temporary Construction Laydown Area

PTC - Performance Test Chamber
I&T - Integration and Test

Scale 1:30,000

0 381 762 Meters

0 1250 2500 Feet

NORTH

0010lf

LTF Site Location Map

Kennedy Space Center, Florida

Table 1: Species with Federal or State Status Potentially Occurring at Kennedy Space Center

Scientific Name	Common Name	Status	
		State	Federal
Plants			
Avicennia germinans	Black mangrove	SP	–
Calamovilfa curtissii	Curtiss reedgrass	E	–
Cereus gracilis	Prickly-apple	T	–
Ophioglossum palmatum	Adder's tongue fern	E	–
Rhizophora mangle	Red mangrove	SP	–
Tournefortia gnaphalodes	Sea lavender	T	–
Zamia umbrosa	East coast coontie	T	–
Reptiles and Amphibians			
Alligator mississippiensis	American alligator	SSC	T (S/A)
Caretta caretta	Atlantic loggerhead turtle	T	T
Chelonia mydas	Atlantic green turtle	E	E
Dermochelys coriacea	Leatherback turtle	E	E
Drymarchon corais couperi	Eastern indigo snake	T	T
Eretmochelys imbricata	Atlantic hawksbill turtle	E	E
Lepidochelys kempi	Kemp's Ridley turtle	E	E
Nerodia clarkii taeniata	Atlantic salt water marsh snake	T	T
Birds			
Aphelocoma coerulescens	Florida scrub jay	T	T
Falco peregrinus tundrius	Arctic peregrine falcon	E	T
Haliaeetus leucocephalus	Bald eagle	T	T
Mycteria americana	Wood stork	E	E
Mammals			
Trichechus manatus	West Indian manatee	E	E
Ursus americanus floridanus	Florida black bear	T	C

Source: Kennedy Space Center, 1997; National Aeronautics and Space Administration, 1997a; U.S. Department of the Interior, 1998.

–	Not listed
SSC	Species of special concern
SP	Special Concern
E	Endangered
T	Threatened
C	Candidate
(S/A)	Listed by similarity of appearance to a listed species

DEPARTMENT OF THE A Y
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF

Environmental Division

Lee Warner, Ph.D.
State Historic Preservation Officer
Executive Director
Alabama Historical Commission
468 South Perry Street
Montgomery, AL 36130-0900

Dear Dr. Warner:

In compliance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality regulations implementing NEPA, and Section 106 of the National Historic Preservation Act, the *Laser Test Facility Environmental Assessment* (EA) is being prepared by the U.S. Army Space and Missile Defense Command for the Ballistic Missile Defense Organization. The EA supports construction and operation of a new Laser Test Facility (LTF). A copy of the Coordinating Final EA is included for your review and comment. A location map of the potential sites in Alabama is enclosed as attachment 1.

As described in our earlier letter dated July 2, 1998, the LTF is a facility necessary to demonstrate the readiness of Space Based Laser technology. No facility exists with the capability for testing the laser systems similar to the Readiness Demonstrator developed under the Zenith Star contract, as well as other similar potential laser systems. The LTF is needed because no existing test facility has the required combination of capabilities, such as the chamber size and management of a high energy, large cross-section laser beam, that would allow this scale of demonstration testing.

The EA describes and addresses the potential impacts of construction and operation of the LTF at four alternative locations: Redstone Arsenal (RSA), Alabama; the Mississippi Army Ammunition Plant (MSAAP) located within Stennis Space Center, Mississippi; Kennedy Space Center Florida; and Cape Canaveral Air Station, Florida.

The LTF would consist of a Performance Test Chamber Complex built on approximately 6 hectares (15 acres) and a 4-hectare (10-acre) construction lay down area. A 1.2-kilometer (0.75-mile) radius safety zone would surround this complex to enclosed

area that could potentially be affected by accidents with the laser reactants. An Integration and Test Complex would occupy approximately 10 hectares (25 acres) outside the safety zone.

The following paragraphs summarize the potential for effects to cultural resources at the Redstone Arsenal, Alabama alternative.

Two archaeological sites recorded within the LTF region of influence (1Ma 630 and 1 Ma 269) are believed to be potentially eligible for inclusion in the National Register. Site 1Ma 630 is located within the potential ground disturbance area and would likely be damaged or possibly destroyed by LTF construction. Because disturbance and/or destruction of a National Register-eligible archaeological site is considered an adverse effect under cultural resources legislation and a significant impact under NEPA, consultation between the RSA Office of Environmental Management and your office would be required to determine an appropriate mitigation.

An historic structure known as the Harris House, building 8012, stands within the LTF Integration and Test Complex. It is immediately north of Buxton Road, located on a rise in the NW ¼ of Sec. 20, T5S, R1W on the USGS 7.5′ Triana, Alabama quadrangle. The Harris House was associated with another historic structure, the Lee Mansion, which was moved from the arsenal. Aside from the high probability of subsurface cultural deposits associated with daily life at the Mansion and the basement the mansion is known to have had, a small cemetery is located to the west of the standing structure. This historic site is considered eligible for the National Register of Historic Places. This historic site will be avoided. The site is shown on attachment 1 with the Harris House and cemetery location indicated and the proposed buffer area marked. All three historic features within this area (i.e., the Penland-Cooper cemetery, the Harris House, and the archaeological site) would be protected from disturbance and visual intrusion through buffering and avoidance; therefore, no effects on these properties would occur. The amount and type of buffering would be determined through consultation between the RSA Office of Environmental Management and Planning and your office.

Any ground disturbance within 30 meters (100 feet) of a cemetery fence would require coordination with the RSA Office of Environmental Management to ensure that no graves are disturbed.

Of the currently identified National Register-listed buildings and structures, none are located within the region of influence for the LTF program; therefore, there would be no effects on these historic properties.

Five World War II-era igloos are located within the direct ground disturbance area of the LTF test facility and will need to be demolished for the construction of the new facility; 65 additional igloos are located within the explosive safety quantity-distance. All 70 igloos, as well as Building 8027, have been evaluated for eligibility for inclusion in the National Register in recent World War II and Cold War properties studies of RSA and preliminarily determined to be ineligible; however, concurrence from your office has not yet been received. Until concurrence from your office is received, these properties must be treated as potentially eligible for inclusion in the National Register for the purposes of this analysis. The remaining 65 igloos, which may also be eligible under the Cold War historic context, are not within the direct ground disturbance area; however, they are located within the LTF explosive safety quantity-distance and have the potential to be damaged in the event of an unexpected explosion.

There are no formally identified traditional cultural properties within the region of influence for LTF activities; therefore, no effects are expected. However, in compliance with Section 106 of the National Historic Preservation Act, the Cherokee, Chickasaw, Choctaw, Coushatta, Creek, Shawnee, Miccosukee, Seminole, and Tunica-Biloxi Indian Tribes will be contacted during the EA process to ensure that any concerns regarding the LTF program are considered. The RSA Office of Environmental Management will initiate any required consultation.

In addition, because archaeological sites, artifacts, and features occur throughout RSA, as well as within, or adjacent to, the LTF region of influence, there is some potential for additional cultural materials to be unexpectedly discovered during the course of project activities. In the event this should occur anywhere within the LTF region of influence, all activities would halt in the immediate area and your office would be consulted through the RSA Office of Environmental Management and Planning.

The purpose of this letter is to continue the Section 106 consultation initiated with our earlier correspondence. It is the U.S. Army Space and Missile Defense Command's desire to ensure that any concerns you might have about our efforts to

identify historic properties and assess potential impacts are addressed. Please review the enclosed Coordinating Final LTF EA and provide written comments or concurrence by December 8, 1999 to Mr. Thomas Craven SMDC-EN-V, U.S. Army Space and Missile Defense Command, P.O. Box 1500, Huntsville, Alabama, 35807-3801. If you have any questions regarding the LTF project, Mr. Craven can also be reached at (256) 955-1533

Sincerely,

John L. Ramey
Lieutenant Colonel, U.S. Army
Deputy Chief of Staff,
Engineer

Enclosures

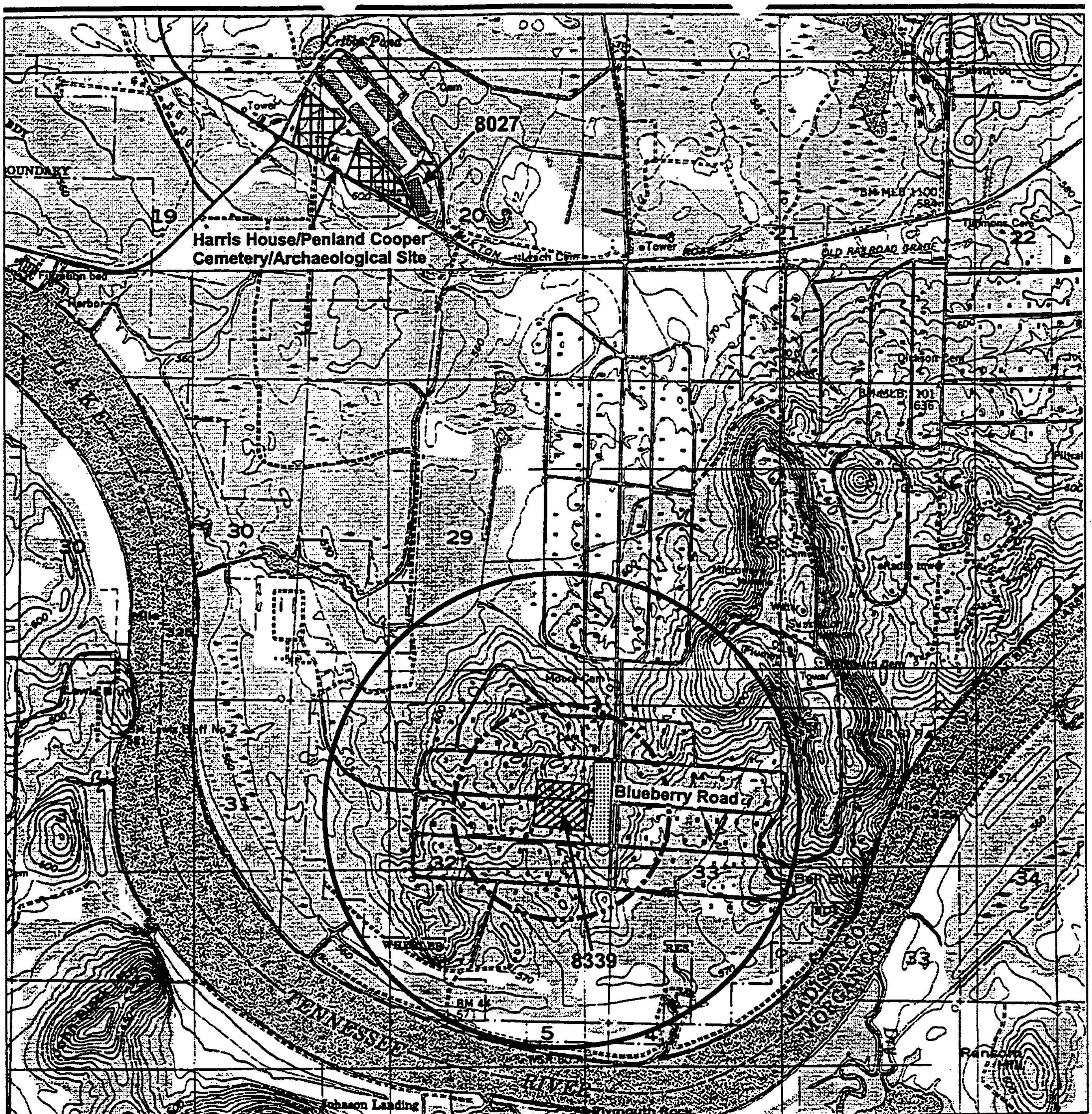
Copies Furnished:

Director, Test and Engineering Resources, ATTN: BMDO-DET (Mr. Crate Spears), 1725 Jefferson Davis Highway, CS2, Suite 809, Arlington, VA 22202-4102

2Lt. Angela Spaith, U.S. Air Force Space and Missile Systems Center, Engagement Systems Division, 2420 Vela Way, Suite 1467-80, Los Angeles Air Force Base, El Segundo, CA 90245-4659

Commanding General, U.S. Aviation and Missile Command, ATTN: AMSAM-RA-EMT-IR (Mr. Whitt Walker), Redstone Arsenal, AL 35898-5340

Attachment 1



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PTC - Performance Test Chamber
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Scale 1:30,000

0 381 762 Meters

0 1,250 2,500 Feet

NORTH

LTF Site Location Map

Redstone Arsenal, Alabama

0017W

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF

Environmental Division

Mr. George W. Percy
Division of Historical Resources and
State Historic Preservation Officer
R.A. Gray Building
500 South Bronough Street
Tallahassee, FL 32399-0250

Dear Mr. Percy:

In compliance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality regulations implementing NEPA, and Section 106 of the National Historic Preservation Act, the *Laser Test Facility Environmental Assessment* (EA) is being prepared by the U.S. Army Space and Missile Defense Command for the Ballistic Missile Defense Organization. The EA supports construction and operation of a new Laser Test Facility (LTF). A copy of the Coordinating Final EA is included for your review and comment. A location map of the potential sites on Kennedy Space Center is also enclosed.

As described in our earlier letter, July 2, 1998, the LTF is a facility necessary to demonstrate the readiness of Space Based Laser technology. The LTF is needed because no existing test facility has the required combination of capabilities, such as the chamber size and management of a high energy, large cross-section laser beam, that would allow this scale of demonstration testing.

The EA describes and addresses the potential impacts of construction and operation of the LTF at four alternative locations: Redstone Arsenal, Alabama; Stennis Space Center, Mississippi; Kennedy Space Center, Florida; and Cape Canaveral Air Station, Florida. Your office will also be receiving a letter from the U.S. Air Force requesting consultation for this same action specifically on Cape Canaveral Air Station.

The LTF would consist of a Performance Test Chamber Complex built on approximately 6 hectares (15 acres) and a 4-hectare (10-acre) construction lay down area. A 1.2-kilometer (0.75-mile) radius safety zone would surround this complex to enclose the area that could potentially be affected by accidents with the

laser reactants. An Integration and Test Complex would occupy approximately 10 hectares (25 acres) outside the safety zone.

The following paragraphs summarize the potential for effects to cultural resources at the Kennedy Space Center alternative.

There are no National Register-listed or -eligible archaeological sites within the direct ground disturbance areas or within the explosive safety quantity-distance around the proposed LTF sites. One National Register-eligible site is located approximately 914 meters (3,000 feet) away from the proposed direct ground disturbance. In order to ensure that this site is not inadvertently damaged during construction and operation activities, construction lay down areas and foot and vehicular traffic will be placed and routed to avoid the site.

No modifications would be required to the two buildings that may be utilized by the LTF project. Based on the ages, historic use, and architectural style of the two buildings within the region of influence, as well as discussions with the Kennedy Space Center Cultural Resources Manager, there is little likelihood that either would be eligible for inclusion in the National Register.

There are no National Register-listed or -eligible traditional cultural properties within either the proposed direct ground disturbance areas. However, the Seminole Indian Tribe will be contacted during the EA process to ensure that any concerns regarding the LTF project are considered.

In the event that cultural materials are unexpectedly discovered during the course of project activities, all activities would cease in the immediate vicinity and your office would be contacted through the Kennedy Space Center Cultural Resources Manager.

The purpose of this letter is to continue the Section 106 consultation initiated with our earlier correspondence. It is the U.S. Army Space and Missile Defense Command's desire to ensure that any concerns you might have about our efforts to identify historic properties and assess potential impacts are addressed. Please review the enclosed Coordinating Draft LTF EA and provide written comments or concurrence by 8 December 1999 to Mr. Thomas Craven SMDC-EN-V, U.S. Army Space and Missile Defense Command, P.O. Box 1500, Huntsville, Alabama, 35807-3801. If you

have any questions regarding the LTF project, Mr. Craven can also be reached at (256) 955-1533. An On Board Review of the EA is currently scheduled for 9-10 December 1999.

Sincerely,

John L. Ramey
Lieutenant Colonel, U.S. Army
Deputy Chief of Staff,
Engineer

Enclosures

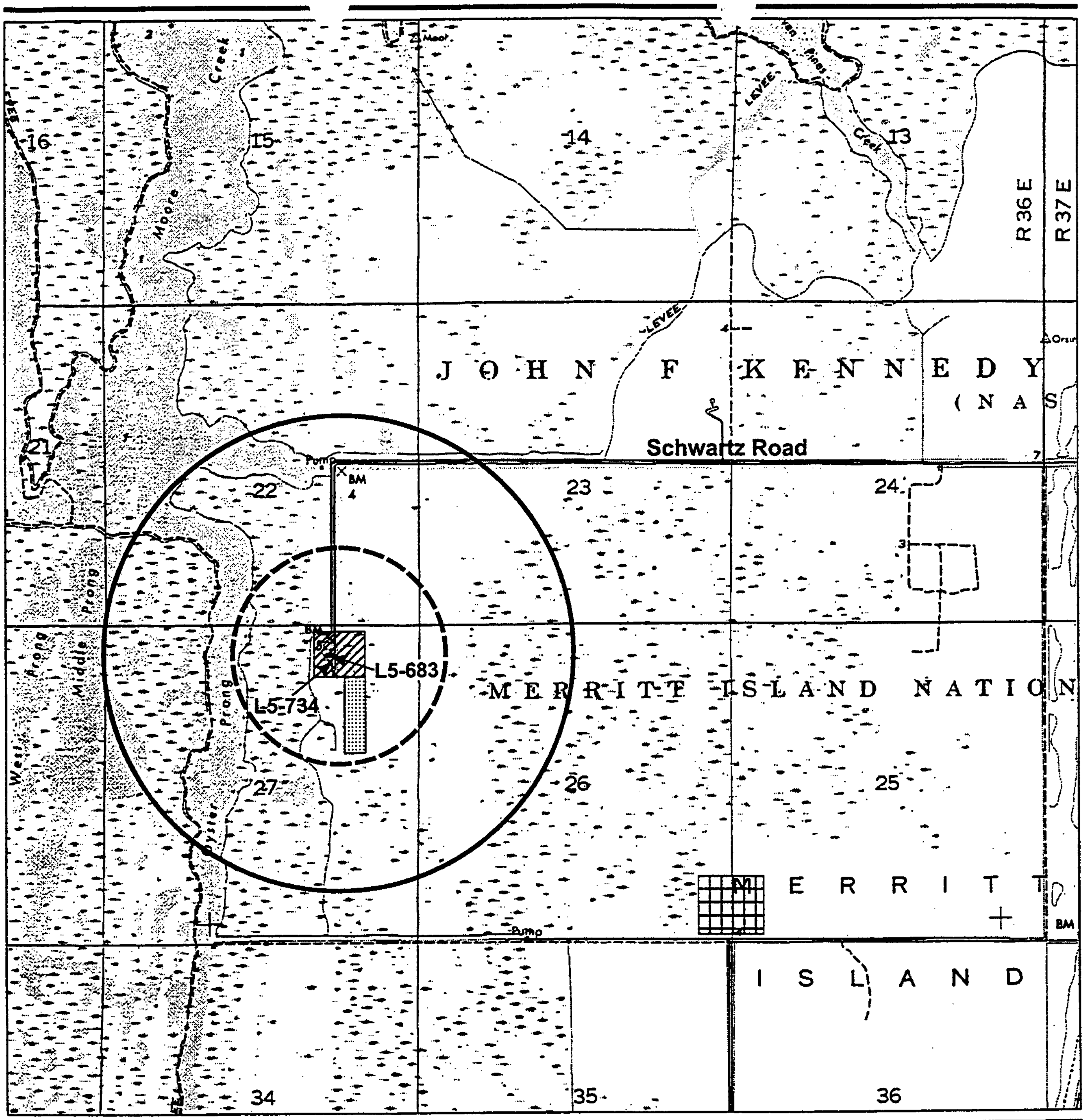
Copies Furnished:

Director, Test and Engineering Resources, ATTN: BMDO-DET (Mr. Crate Spears), 1725 Jefferson Davis Highway, CS2, Suite 809, Arlington, VA 22202-4102

2Lt. Angela Spaith, U.S. Air Force Space and Missile Systems Center, Engagement Systems Division, 2420 Vela Way, Suite 1467-80, Los Angeles Air Force Base, El Segundo, CA 90245-4659

Mr. Mario Busacca, Kennedy Space Center, Mail Code: JJ-D, Kennedy Space Center, Florida 32899

Attachment 1



EXPLANATION

- ESQD 549 meters (1,800 feet)
- Safety Zone 1,207 meters (3,960 feet)
- PTC Complex
- I&T Complex
- Temporary Construction Laydown Area

PTC - Performance Test Chamber
I&T - Integration and Test

LTF Site Location Map

Kennedy Space Center, Florida

Scale 1:30,000

0 381 762 Meters

0 1250 2500 Feet

NORTH

0010

DEPARTMENT OF THE A Y
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF

Environmental Division

Elbert Hilliard, State Historic Preservation Officer
Director, Mississippi Department of
Archives and History
P.O. Box 571
618 East Pearl Street
Jackson, MS 39205

Dear Mr. Hilliard:

In compliance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality regulations implementing NEPA, and Section 106 of the National Historic Preservation Act, the *Laser Test Facility Environmental Assessment* (EA) is being prepared by the U.S. Army Space and Missile Defense Command for the Ballistic Missile Defense Organization. The EA supports construction and operation of a new Laser Test Facility (LTF). A copy of the Coordinating Final EA is included for your review and comment. A location map for the potential site in Mississippi is also enclosed.

As described in our earlier letter dated July 2, 1998, the LTF is a facility necessary to demonstrate the readiness of Space Based Laser technology. No facility exists with the capability for testing the laser systems similar to the Readiness Demonstrator developed under the Zenith Star contract, as well as other similar potential laser systems. The LTF is needed because no existing test facility has the required combination of capabilities, such as the chamber size and management of a high energy, large cross-section laser beam, that would allow this scale of demonstration testing.

The EA describes and addresses the potential impacts of construction and operation of the LTF at four alternative locations: Redstone Arsenal, Alabama; the Mississippi Army Ammunition Plant (MSAAP) located within Stennis Space Center, Mississippi; Kennedy Space Center Florida; and Cape Canaveral Air Station, Florida.

The LTF would consist of a Performance Test Chamber Complex built on approximately 6 hectares (15 acres) and a 4-hectare (10-acre) construction lay down area. A 1.2-kilometer (0.75-mile)

radius safety zone would surround this complex to enclose the area that could potentially be affected by accidents with the laser reactants. An Integration and Test Complex would occupy approximately 10 hectares (25 acres) outside the safety zone.

The following paragraphs summarize the potential for effects to cultural resources at the Stennis Space Center (SSC), Mississippi alternative.

Prehistoric and historic archaeological survey of the SSC Fee Area, including the area of the MSAAP and the LTF project area are considered complete by your office and no further studies are required. Except for archaeological sites and artifacts located in the areas of the Gainesville and Logtown townsites (outside the region of influence for LTF), there are no sites within the Fee Area or the region of influence.

To ensure that historic resources are appropriately considered during construction planning, a Preliminary Environmental Study form has been developed that must be completed by any proponent of an activity at SSC. The form must be submitted to the Environmental Office for consideration before any construction. In addition, all construction contracts will contain language that requires notification to the Contracting Officer of any archaeological finds discovered during construction. Therefore, there would be no effect on cultural resources from activities associated with construction of the LTF facilities.

There are no National Register-listed or eligible buildings within the region of influence for the LTF program; therefore, there would be no effects on historic properties.

There are no traditional cultural properties within the region of influence for LTF activities; therefore, no effects are expected. However, in compliance with Section 106 of the National Historic Preservation Act, the Mississippi Band of Choctaw Indians will be contacted during the EA process to ensure that any concerns regarding the LTF program are considered.

Because archaeological sites and artifacts are known to occur within the boundary of the installation, there is some potential for cultural materials to be unexpectedly discovered during the course of project activities. In the event this should occur, all activities would halt in the immediate area and your office would be consulted through the SSC Environmental Office.

The purpose of this letter is to continue the Section 106 consultation initiated with our earlier correspondence. It is the U.S. Army Space and Missile Defense Command's desire to ensure that any concerns you might have about our efforts to identify historic properties and assess potential impacts are addressed. Please review the enclosed Coordinating Draft LTF EA and provide written comments or concurrence by 8 December 1999 to Mr. Thomas Craven SMDC-EN-V, U.S. Army Space and Missile Defense Command, P.O. Box 1500, Huntsville, Alabama, 35807-3801. If you have any questions regarding the LTF project, Mr. Craven can also be reached at (256) 955-1533.

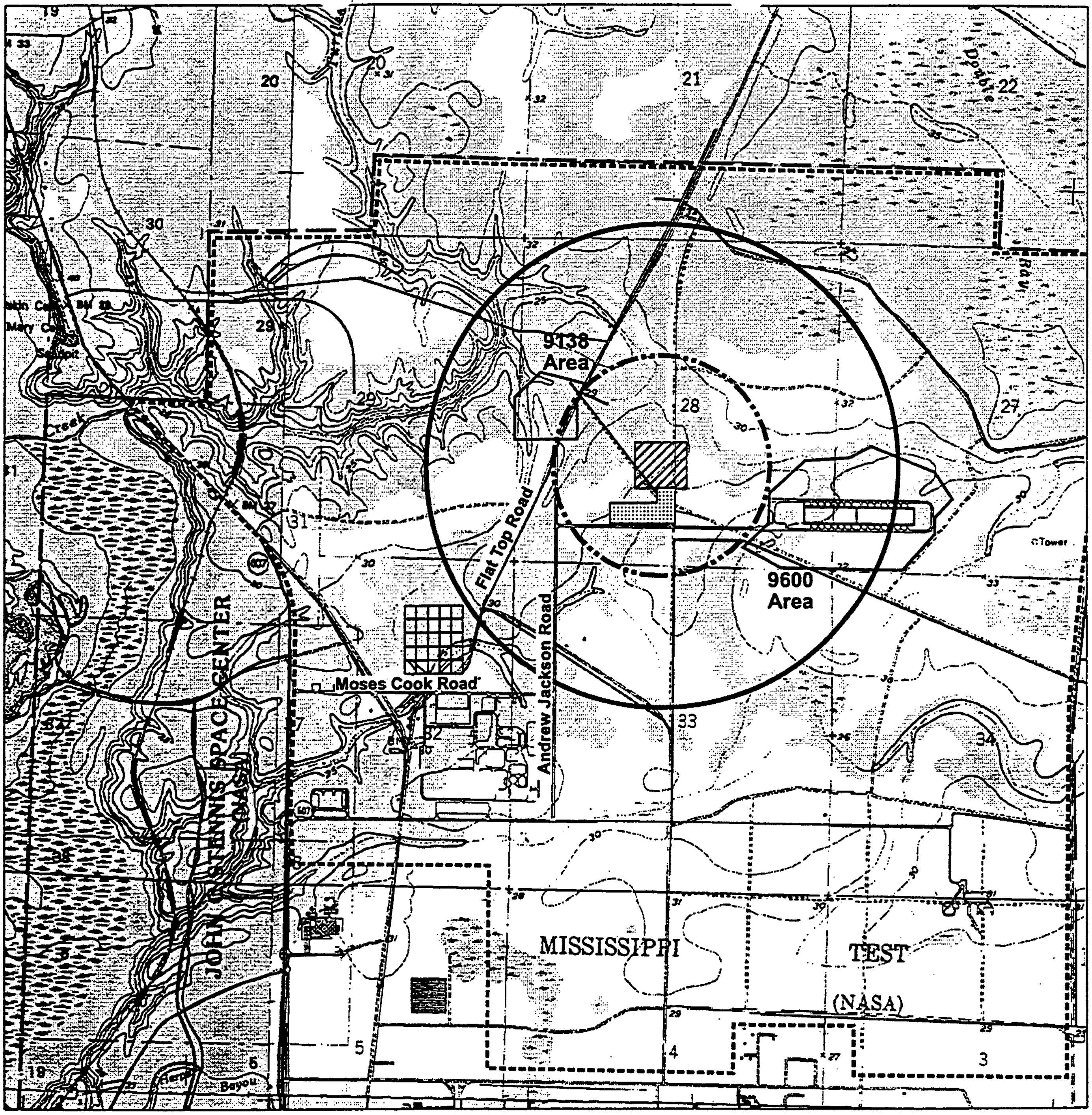
Sincerely,

John L. Ramey
Lieutenant Colonel, U.S. Army
Deputy Chief of Staff,
Engineer

Enclosures

Copies Furnished:

Director, Test and Engineering Resources, ATTN: BMDO-DET (Mr. Crate Spears), 1725 Jefferson Davis Highway, CS2, Suite 809, Arlington, VA 22202-4102
2Lt. Angela Spaith, U.S. Air Force Space and Missile Systems Center, Engagement Systems Division, 2420 Vela Way, Suite 1467-80, Los Angeles Air Force Base, El Segundo, CA 90245-4659
Mr. Ronald G. Magee, National Aeronautical Space Administration, Building 110, Room 3012-B, Stennis Space Center, MS 39529
Mr. John Cecconi, Mississippi Army Ammunition Plant, SIOMS-CR-Bldg 9100, Stennis Space Center, MS 39529-7000



EXPLANATION

- ESQD 549 meters (1,800 feet)
- Safety Zone 1,207 meters (3,960 feet)
- Stennis Space Center Boundary
- Mississippi Army Ammunition Plant Boundary
- PTC Complex
- I&T Complex
- Temporary Construction Laydown Area

PTC - Performance Test Chamber
I&T - Integration and Test

Scale 1:30,000

0 381 762 Meters

0 1250 2500 Feet

NORTH

0026tf

LTF Site Location Map

Stennis Space Center, Mississippi

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF
Environmental Division

NOV 18 1999

Mr. George W. Percy
State Historic Preservation Officer
500 South Bronough Street
Tallahassee, Florida 32399-0250

Dear Mr. Percy:

In our letter sent on November 8, 1999, discussing the Laser Test Facility (LTF) Environmental Assessment (EA) being prepared for the Ballistic Missile Defense Organization, consultation with affected Native American Tribes was mentioned. However, no effects are expected to traditional resources from the project since there are no formally identified traditional cultural properties within the region of influence for LTF activities. Based on this lack of traditional resources in the proposed project areas and additional discussions with the affected installation, it has been determined that consultation with the Seminole Indian Tribe is not necessary. However, in compliance with Section 106 of the National Historic Preservation Act, we are willing to discuss any consultation direction from your office.

As mentioned in the earlier letter, it is the U.S. Army Space and Missile Defense Command's desire to ensure that any concerns you might have are addressed. If you have any questions regarding the LTF project, please contact U.S. Army Space and Missile Defense Command, Attention: SMDC-EN-V (Mr. Thomas Craven), P.O. Box 1500, Huntsville, Alabama, 35807-3801. Mr. Craven can also be reached at (256) 955-1533.

Sincerely,

John L. Ramey
Lieutenant Colonel, U.S. Army
Deputy Chief of Staff,
Engineer

Copies Furnished:

Director, Test and Engineering Resources, ATTN: BMDO-DET (Mr. Crate Spears), 1725 Jefferson Davis Highway, CS2, Suite 809, Arlington, VA 22202-4102

U.S. Air Force Space and Missile Systems Center, Engagement Systems Division, ATTN: 2Lt Angela Spaith, 2420 Vela Way, Suite 1467-80, Los Angeles Air Force Base, El Segundo, CA 90245-4658

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

NOV 18 1999

REPLY TO ATTENTION OF
Environmental Division

Mr. Lee Warner, Ph.D.
State Historic Preservation Officer
Alabama Historical Commission
468 South Perry Street
Montgomery, Alabama 36130-0900

Dear Dr. Warner:

In our letter sent on November 8, 1999, discussing the Laser Test Facility (LTF) Environmental Assessment (EA) being prepared for the Ballistic Missile Defense Organization, consultation with affected Native American Tribes was mentioned. However, no effects are expected to traditional resources from the project since there are no formally identified traditional cultural properties within the region of influence for LTF activities. Based on this lack of traditional resources in the proposed project areas and additional discussions with the affected installation, it has been determined that consultation with the Native American Cherokee, Chickasaw, Choctaw, Coushatta, Creek, Shawnee, Miccosukee, Seminole, and Tunica-Biloxi Indian Tribes is not necessary. However, in compliance with Section 106 of the National Historic Preservation Act, we are willing to discuss any consultation direction from your office.

As mentioned in the earlier letter, it is the U.S. Army Space and Missile Defense Command's desire to ensure that any concerns you might have are addressed. If you have any questions regarding the LTF project, please contact U.S. Army Space and Missile Defense Command, Attention: SMDC-EN-V (Mr. Thomas Craven), P.O. Box 1500, Huntsville, Alabama 35807-3801. Mr. Craven can also be reached at (256) 955-1533.

Sincerely,

John L. Ramey
Lieutenant Colonel, U.S. Army
Deputy Chief of Staff,
Engineer

Copies Furnished:

Director, Test and Engineering Resources, ATTN: BMDO-DET (Mr. Crate Spears), 1725 Jefferson Davis Highway, CS2, Suite 809, Arlington, VA 22202-4102

U.S. Air Force Space and Missile Systems Center, Engagement Systems Division, ATTN: 2Lt Angela Spaith, 2420 Vela Way, Suite 1467-80, Los Angeles Air Force Base, El Segundo, CA 90245-4658

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO ATTENTION OF

NOV 18 1999

Environmental Division

Mr. Elbert Hilliard,
State Historic Preservation Officer
Director, Mississippi Department of
Post Office Box 571
618 East Pearl Street
Jackson, Mississippi 39205

Dear Mr. Hilliard:

In our letter sent on November 8, 1999, discussing the Laser Test Facility (LTF) Environmental Assessment (EA) being prepared for the Ballistic Missile Defense Organization, consultation with affected Native American Tribes was mentioned. However, no effects are expected to traditional resources from the project since there are no formally identified traditional cultural properties within the region of influence for LTF activities. Based on this lack of traditional resources in the proposed project areas and additional discussions with the affected installation, it has been determined that consultation with the Mississippi Band of Choctaw Indians is not necessary. However, in compliance with Section 106 of the National Historic Preservation Act, we are willing to discuss any consultation direction from your office.

As mentioned in the earlier letter, it is the U.S. Army Space and Missile Defense Command's desire to ensure that any concerns you might have are addressed. If you have any questions regarding the LTF project, please contact U.S. Army Space and Missile Defense Command, Attention: SMDC-EN-V (Mr. Thomas Craven), P.O. Box 1500, Huntsville, Alabama, 35807-3801. Mr. Craven can also be reached at (256) 955-1533

Sincerely,

John L. Ramey
Lieutenant Colonel, U.S. Army
Deputy Chief of Staff,
Engineer

Copies Furnished:

Director, Test and Engineering Resources, ATTN: BMDO-DET (Mr. Crate Spears), 1725 Jefferson Davis Highway, CS2, Suite 809, Arlington, VA 22202-4102

U.S. Air Force Space and Missile Systems Center, Engagement Systems Division, ATTN: 2Lt Angela Spaith, 2420 Vela Way, Suite 1467-80, Los Angeles Air Force Base, El Segundo, CA 90245-4658

United States Department of the Interior

FISH AND WILDLIFE SERVICE
6620 Southpoint Drive South
Suite 310
Jacksonville, Florida 32216-0958

IN REPLY REFER TO:
FWS/R4/ES-JAFL

November 30, 1999

Commander,
U.S. Army and Missile Defense Command
P.O. Box 1500
Huntsville, Alabama 35807-3801

Attn: SMDC-EN-V (Mr. Thomas M. Craven)

FWS Log No: 00-356

Dear Sir:

This responds to your letter requesting consultation pursuant to section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*), for the *Laser Test Facility Environmental Assessment* (EA) prepared by the Army Space and Missile Defense Command for the Ballistic Missile Defense Organization. The EA describes the proposed project, and the four potential locations for the project; Kennedy Space Center (KSC), Cape Canaveral Air Station (CCAS), Redstone Arsenal, and Stennis Space Center. The EA did not identify a preferred alternative.

We have reviewed the EA, in particular the sections discussing the affected environment and environmental consequences. Our comments only pertain to KSC and CCAS as it applies to section 7 consultation and the broader context of refuge impacts. Our comments represent the views of both the Ecological Services Field Office in Jacksonville and the Merritt Island National Wildlife Refuge.

Our primary concern is that the EA lacks specific information on the effects, both direct and indirect, this project would have on federally threatened and endangered species identified in the EA. The narratives in the EA are too general to accurately predict what may occur if the project were built at either KSC or CCAS.

Also, there is no discussion of the impact a project of this proportion would have on the future management of the Merritt Island National Wildlife Refuge on KSC. This refuge has one of the highest numbers of federally listed threatened and endangered species in the United States. Access

to the various habitats surrounding the site would be seriously curtailed by the proposed action. This would affect water level management, exotic plant control, feral animal removal, and surveys of wildlife populations. It continues to be our view that if KSC is selected as the preferred site, an Environmental Impact Statement must be prepared. In our view, an EA and Finding of No Significant Impact do not satisfy the requirements of the National Environmental Policy Act (NEPA) for a project of this magnitude.

The EA contains no discussion of the secondary impacts of this project on future land management activities at either KSC or CCAS. For example, KSC and CCAS comprise one of three Florida scrub-jay population centers in the state, and both facilities are critical for the future survival and recovery of this species. While they are managed by different Federal agencies, they are by no means independent from each other when in terms of the survival and recovery of several listed threatened and endangered species. There has been and continues to be a close working relationship between the environmental staffs from both installations and the refuge to managed the habitats for listed species.

In order to maintain scrub-jays on these sites prescribed burning is required. The effect of locating this project at either KSC or CCAS on the ability of the land managers to conduct prescribed burns must be analyzed. As a result of current missions at KSC and CCAS, the ability to conduct burns are presently hindered. It seems this project would only further exacerbate this problem. For example, at KSC, the Merritt Island National Wildlife Refuge's fire management officer indicated that as much as 20,000 acres of habitat, much of it scrub habitat, may be affected by this project because of smoke management issues. This reduction could have a significant affect on the future survival of scrub-jays on KSC, and ultimately on the population of scrub-jays on CCAS. Additionally, there should be a discussion of the future of the buildings after the two-year test is completed. The EA did not adequately explain the long-term impacts of the proposed project on the potential project sites.

The EA contained no discussion of the federally threatened southeastern beach mouse, in particular at CCAS. The proposed location of the project at CCAS and its proximity to the beach may adversely affect this species. We are very concerned that an inadvertent release of hydrogen fluoride, a hazardous air pollutant, would adversely affect this species. With reference to the toxic gas, there should be more discussion as to its affect on all listed species. In addition, the discussion should also include non-listed wildlife, including plants.

We are concerned that a structure that is 238 feet tall, close to the beach, and lighted, would negatively affect nesting sea turtles and hatchlings on CCAS. There was no discussion in the EA regarding potential hatchling disorientation. The mere reference to the adoption of the light management plan in the EA is insufficient. We need to review the light management plan for this particular project. This is consistent with past consultations with CCAS and KSC.

In regard to the section 7 request, we believe the Army should select a preferred alternative prior to requesting section 7 consultation. As it currently stands, the EA is lacking detail regarding direct and indirect affects of the project on listed species. Much more information is required before consultation can be initiated. We recommend, therefore, consultation be postponed until a

preferred alternative is selected, and more specific information is provided on the effect of the program on listed species.

With reference to the proposed wetland fill on KSC, the Service's Mitigation Policy and the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act both identify a preferred sequence for addressing mitigation of wetland impacts. Emphasis is first on avoiding wetland impacts; followed by minimizing impacts; and finally compensating any unavoidable adverse impacts. We understand the alternative upland site at Tel-4 would have unacceptable impacts to the scrub habitat on the refuge. It is obvious to us that the refuge is composed of a mosiac of wetlands and scrub habitats, thus requiring extensive compensatory mitigation for any site chosen. The EA did not include a detailed plan to compensate for unavoidable wetland loss. There was a brief mention of wetland impacts and mitigation, but it was far too general.

Thank you for the opportunity to provide these comments. For further coordination, please contact Don Palmer in this office.

Sincerely,

for David L. Hankla
Field Supervisor

Ron Hight
Ron Hight
Refuge Manager

Mississippi Department of Archives and History

Established 1902

Historic Preservation Division • Post Office Box 571 • Jackson, Mississippi 39205-0571
Phone 601 / 359-6940 • Fax 601 / 359-6955

December 3, 1999

Mr. Thomas Craven SMDC-EN-V
U. S. Army Space and Missile Defense Command
P. O. Box 1500
Huntsville, Alabama 35807-3801

Dear Mr. Craven:

RE: Coordinating Final Laser Test Facility Environmental Assessment
Stennis Space Center, Hancock County

We have reviewed the Coordinating Final Laser Test Facility Environmental Assessment dated November, 1999. We concur that no properties listed in or eligible for listing in the National Register of Historic Places will be affected. We, therefore, have no further reservations with this undertaking.

There remains a very remote possibility that unrecorded cultural resources may be encountered during construction. If this occurs, we would appreciate your contacting this office immediately in order that we may offer appropriate comments under 36 CFR 800.11 within forty-eight hours.

Sincerely,

Elbert R. Hilliard
State Historic Preservation Officer

Thomas H. Waggener

By: Thomas H. Waggener
Review and Compliance Officer

cc: Clearinghouse for Federal Programs

United States Department of the Interior

FISH AND WILDLIFE SERVICE
P. O. Drawer 1190
Daphne. Alabama 36526

IN REPLY REFER TO: 00-0342a

December 8, 1999

Commander, U.S. Army Space and Missile Defence Command
Attn: SMDC-EN-V (Mr. Thomas M. Craven)
Post Office Box 1500
Huntsville, Alabama 35807-3801

Dear Sir:

We are responding to your letter requesting comments on the Laser Test Facility Environmental Assessment (EA) on potential sites in Alabama and Mississippi. We have reviewed the information you enclosed and are providing the following comments in accordance with the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C 1531 et seq.).

Although we have read the Environmental Assessment of your findings concerning endangered species, we have concerns about several aspects of the project that need to be addressed.

Redstone Arsenal Site:

The deposition of 9.5 kilograms of hydrogen fluoride and 68,000 liters of water per test, certainly has potential for impacting any wildlife species present, as well as other important resource systems. We do not agree with your findings about the effect that 9.5 kilograms of hydrogen fluoride would have. We are concerned that sixteen (16) tests per year, plus the karst topography, and the site's relative location to the Tennessee River all increase the potential for ground water contamination at the Redstone Arsenal site.

Although noise levels are mentioned in the EA, more as a matter of opinion rather than fact, we believe once a site has been selected a more detailed Environmental Impact Statement (EIS) be made and more emphasis be given to its effect during animal breeding and hibernation seasons.

Stennis Space Site:

The EA states that any wetlands filled during construction could be mitigated through areas already established on the Stennis Space Center site. Once a site has been selected, wetland delineation and mitigation needs to be coordinated with the U.S. Army Corps of Engineer and contact this office so that we might coordinate our work together

If you have any questions or need additional information, please contact Mr. Bert W.Steen at (334) 441-5181, ext. 38. Please refer to the reference number located at the top of this letter.

Sincerely,

Larry E. Goldman
Field Supervisor

City of Titusville

555 SOUTH WASHINGTON AVENUE
TITUSVILLE, FLORIDA 32796-3584
POST OFFICE BOX 2806 (32781-2806)

TITUSVILLE, FLORIDA FOUNDED 1867

(407) 269-4400
FAX (407) 383-5700

December 9, 1999

Department of the Army
U.S. Space and Missile Defense Command
Attention: Thomas Craven
P.O. Box 1500
Huntsville, Alabama 35807-3801

Dear Mr. Thomas Craven:

Re: The Laser Test Facility Environmental Assessment (LTFEA)

At its regular meeting on December 8, 1999, the Titusville Environmental Commission reviewed the LTFEA and had no objections to the proposed work. The City of Titusville appreciates the opportunity to review and provide comments on this environmental assessment and would like to be informed of the final location of facility.

Sincerely,

Keith Cunningham,
Planning Administrator

KGC/cfp

Space City, USA

STATE OF ALABAMA
ALABAMA HISTORICAL COMMISSION
468 SOUTH PERRY STREET
MONTGOMERY, ALABAMA 36130-0900

LEE H. WARNER
EXECUTIVE DIRECTOR

TEL: 334-242-3184
FAX: 334-240-3477

December 11, 1999

John L. Ramey
Colonel, U.S. Army
Deputy Chief of Staff
U.S. Army Space & Missile Defense Command
P.O. Box 1500
Huntsville, Alabama 35807-3801

Re: AHC 00-0241
Environmental Assessment
Laser Test Facility
Redstone Arsenal
Madison County, Alabama

Dear Colonel Ramey:

Upon review of the information forwarded by your office, the Alabama Historical Commission has determined the following:

1. We agree with the avoidance of the cemetery and placing a 150 foot buffer around the cemetery.
2. Archaeological site 1 Ma 630 is potentially eligible for the National Register. If it can not be avoided, Phase II testing proposals should be developed and forwarded to our office for review and approval prior to implementation.
3. We agree that avoidance and buffering of the Harris House could avoid effects to the building although we should consult to determine exactly what kind of buffering is needed.
4. The World War II study which includes the igloos has not been completed so they must be treated as potentially eligible. We recommend that a property type study about the role the igloos played in Redstone's mission as mitigation. This could include representative photographs and plans rather than a structure by structure by report.
5. Building 8027 will also have to be considered eligible until the Cold War study is complete. If the study is at a point where the author can provide us with a justification for their determination, we request that this be forwarded to our office.

THE STATE HISTORIC PRESERVATION OFFICE
www.preserveala.org

We appreciate your continued efforts on this project and we look forward to working with you to its completion. Should you have any questions or comments, please contact Blythe Semmer or Greg Rhinehart of our office.

Sincerely,

Elizabeth Ann Brown
Deputy State Historic Preservation Officer

EAB/TOM/JBS/GCR

SMDC-EN-V (200) 14 December 1999

MEMORANDUM FOR RECORD

SUBJECT: Laser Test Facility Environmental Assessment - Record of Conversation, Oscar B. Echkoff

1. On 8 December 1999, I received a voice mail message from Oscar B. Eckhoff, 701 Williams Ave, Picayune, MS 39466. Mr. Eckhoff wished to provide some information on the Laser Test Facility Environmental Assessment that was out for public comment.

2. I called Mr. Eckhoff several times over the next few days and reached him on 13 December 1999.

3. Mr. Eckhoff wanted to share some information about placement of facilities in regard to earthquakes. He stated that he had recently attended a seismological association meeting in Memphis. While there he had learned that shearwave velocity in strata beneath the proposed structure was useful in determining where to place the facility.

4. He also asked if everyone would have to exit the safety zone while testing because of emissions. I explained that the safety zone, presently set at 0.75-mile was established based on other facilities. I also explained about the explosive safety quantity distance, ESQD, which was 1800 feet for the amount so f reactants planned presently. I also told him that the PRS was planned to remove between 95 and 99% of the HF in the emissions, and as such would result in very small quantities being released. But for a variety of safety reasons, the zone would be evacuated prior to testing.

5. He thanked me and we concluded the call.

Thomas M. Craven

THOMAS M. CRAVEN
Environmental Protection Specialist
Environmental Policy, Compliance,
Remediation Branch
Space and Missile Defense Command

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Appendix C
Environmental Laws and Regulations

APPENDIX C
ENVIRONMENTAL LAWS AND REGULATIONS

The following Federal environmental laws and regulations were reviewed to assist in determining the significance of environmental impacts under the National Environmental Policy Act (NEPA).

Air Quality

The Clean Air Act seeks to achieve and maintain air quality to protect public health and welfare (42 United States Code [U.S.C.] 7401 et seq.). To accomplish this, Congress directed the U.S. Environmental Protection Agency (U.S. EPA) to establish National Ambient Air Quality Standards (NAAQS). Primary standards protect public health; secondary standards protect public welfare (e.g., vegetation, property damage, scenic value). The NAAQS address six criteria pollutants: carbon monoxide, nitrogen oxides, lead, sulfur dioxides, ozone, and particulates. State agencies either adopt the NAAQS as the state standard or adopt standards that are more stringent. Table C-1 summarizes the NAAQS and Florida state standards. Both Alabama and Mississippi have state standards equivalent to the NAAQS.

Primary responsibility to implement the Clean Air Act rests with each state. However, each state must submit a state implementation plan (SIP) outlining the strategy for attaining and maintaining the NAAQS within the deadlines established by the act. If the state does not provide a SIP that is acceptable to the U.S. EPA, the U.S. EPA will provide a SIP, which the state is then required to enforce.

The Clean Air Act mandates establishment of performance standards, called New Source Performance Standards, for selected categories of new and modified stationary sources to keep new pollution to a minimum. Under the act, the U.S. EPA can establish emission standards for hazardous air pollutants for both new and existing sources. So far, the U.S. EPA has set National Emission Standards for Hazardous Air Pollutants (NESHAP) for asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury radionuclides, and vinyl chloride.

The Clean Air Act also seeks to prevent significant deterioration of air quality in areas where the air is cleaner than that required by the NAAQS. Areas subject to prevention of significant deterioration regulations have a Class I, II, or III designation. Class I allows the least degradation.

Table C-1: Federal and State Ambient Air Quality Standards

Pollutant	Averaging Time[4]	Florida Standards[3, 6]	Federal Primary Standards[3]	Federal Secondary Standards[3]
Carbon Monoxide	8-hour 1-hour	9 ppm (10 mg/m^3) 35 ppm (40 mg/m^3)	10 mg/m^3 (9 ppm) 40 mg/m^3 (35 ppm)	None None
Lead	Quarterly	1.5 µg/m^3 [1]	1.5 µg/m^3 [1]	Same as Primary
Nitrogen Dioxide	Annual	100 µg/m^3 (0.05 ppm)	100 µg/m^3 (0.053 ppm)	Same as Primary
Ozone	8-hour 1-hour	None 0.12 ppm (250 µg/m^3)	0.08 ppm (167 µg/m^3) None	Same as Primary Same as Primary
PM-10	Annual 24-hour	50 µg/m^3 [2] 150 µg/m^3 [2]	50 µg/m^3 [2] 150 µg/m^3 [2]	Same as Primary Same as Primary
PM-2.5	Annual[5] 24-hour	None None	15.0 µg/m^3 [2] 65 µg/m^3 [2]	None None
Sulfur Dioxide	Annual 24-hour 3-hour	60 µg/m^3 (0.02 ppm) 260 µg/m^3 (0.1 ppm) 1,300 µg/m^3 (0.5 ppm)	80 µg/m^3 (0.03 ppm) 365 µg/m^3 (0.14 ppm) None	None None 1,300 µg/m^3 (0.5 ppm)

Notes:
ppm = parts per million by volume
mg/m^3 = milligrams per cubic meter
µg/m^3 = micrograms per cubic meter
PM-10 = Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers
PM-2.5 = Particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers
(1) Standard for lead has no ppm equivalent
(2) Standards for particulates have no mass/volume equivalent
(3) Standards are presented with the actual standard first and the equivalent in parenthesis
(4) Annual and quarterly averages are arithmetic means
(5) The annual average for PM-2.5 is the arithmetic mean of 24-hour averages
(6) Alabama and Mississippi have state standards equivalent to the Federal standards

Nonattainment policies also exist. A nonattainment area is one where monitoring data or air quality modeling demonstrates a violation of the NAAQS. The most widespread violation of the NAAQS is related to ozone. For ozone, urban areas are sorted into five categories: marginal, moderate, serious, severe, and extreme. Additionally, stratospheric ozone and climate protection policies have been established. Interim reductions in the phaseout of chlorofluorocarbons, methyl chloroforms, and halons have been mandated. Hydrochlorofluorocarbons must be phased out of production beginning in 2015, with production elimination set for 2030. State and local governments are required to implement policies that prevent construction or modification of any source that will interfere with attainment and maintenance of ambient standards. A new source must demonstrate a net air quality benefit. The source must secure offsets from existing sources to achieve the air quality benefit.

The Clean Air Act Amendments of 1990 represent the first significant revisions to the Clean Air Act in the past 13 years (42 U.S.C. 7401 et seq.). The amendments strengthen and broaden earlier legislation by setting specific goals and timetables for reducing smog,

airborne toxins, acid rain, and stratospheric ozone depletion over the next decade and beyond.

The Clean Air Act Amendments of 1990 contain 11 major titles that address various issues of the National Air Pollution Control Program. Title I, Attainment and Maintenance of National Ambient Air Quality Standards, mandates technology-based emissions control for new and existing major air pollution sources. Title II, Mobile Sources, deals with emissions control for motor vehicles in the form of tailpipe standards, use of clean fuels, and mandatory acquisition of clean-fuel vehicles. Hazardous Air Pollutants, Title III, mainly addresses the control of hazardous air pollutants (HAPs) and contingency planning for the accidental release of hazardous substances. There are 188 HAPs identified in the new amendments. Title IV, Acid Rain, focuses on the reduction of sulfur dioxide and nitrogen oxides in the effort to eliminate acid rain. Permits, Title V, establishes a nationwide permit program for air pollution sources. The permits will clarify operating and control requirements for affected stationary sources. Stratospheric Ozone Protection, Title VI, restricts the production and use of chlorofluorocarbons, halons, and other halogenated solvents which, when released into the atmosphere, contribute to the decomposition of stratospheric ozone. Title VII, Enforcement, describes civil and criminal penalties that may be imposed for the violation of new and existing air pollution control requirements. Title VIII of the 1990 amendments contains various miscellaneous provisions concerning the outer continental shelf, international border areas, grants, secondary standards, renewable energy incentives, and visibility. Information and rules related to clean air research can be found in Title IX. The U.S. EPA is to conduct studies on improved methods and techniques for measuring individual air pollutants, health effects associated with exposure to air pollutants, improvements in predictive models and response technology for accidental releases of dense gas, acid precipitation, clean fuels, and improved studies on the ecosystem, among others. Title X requires that a certain percentage of Federal funds, set aside for research required under the act, be made available to disadvantaged businesses. Title XI contains laws pertaining to Clean Air Employment Transition Assistance. Topics covered in this title include the Job Partnership Training Act provisions, funding, benefits, and eligibility requirements.

Airspace

The Federal Aviation Act of 1958 (Public Law 85-726) created the Federal Aviation Agency (later Administration) to provide for the regulation and promotion of civil aviation in such a manner as to best foster its development and safety and to provide for the safe and efficient use of airspace by both civil and military aircraft, contribute to national security, and provide for other purposes.

The Federal Aviation Administration (FAA), as an operating agency under the Department of Transportation, has further developed its purpose to include: regulating air commerce to foster aviation safety, developing a national system of airports, and achieving efficient use of airspace. In addition, it is charged with operating common air traffic control and air navigation systems for both civil and military users.

The FAA's most important mission is to ensure safe and efficient use of the national airspace. The National Airspace System is based on an extensive network of air traffic control computers, surveillance, communication, navigation, and landing systems.

Biological Resources

The Endangered Species Act declares that it is the policy of Congress that all Federal departments and agencies shall seek to conserve endangered species and threatened species (16 U.S.C. 1531 et seq.). Further, the act directs Federal agencies to use their authorities in furtherance of the purposes of the act.

Under the Endangered Species Act, the Secretary of the Interior creates lists of endangered and threatened species. The term endangered species means any species that is in danger of extinction throughout all or a significant portion of its range. The act defines a threatened species as any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

A key provision of the Endangered Species Act for Federal activities is Section 7 consultation. Under Section 7 of the act, every Federal agency must consult with the Secretary of the Interior, U.S. Fish and Wildlife Service (USFWS), to ensure that any agency action (authorization, funding, or execution) is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of habitat of such species.

The Bald and Golden Eagle Protection Act establishes penalties for the unauthorized taking, possession, selling, purchase, or transportation of bald or golden eagles, their nests, or their eggs (16 U.S.C. 668 et seq.). Any Federal activity that might disturb eagles requires consultation with the USFWS for appropriate mitigation.

Through the Fish and Wildlife Coordination Act, Congress encourages all Federal departments and agencies to utilize their statutory and administrative authority, to the maximum extent practicable and consistent with each agency's statutory responsibilities, to conserve and promote conservation of nongame fish and wildlife and their habitats (16 U.S.C. 2901 et seq.). Further, the act encourages each state to develop a conservation plan.

The Fish and Wildlife Coordination Act requires a Federal department or agency that proposes or authorizes the modification, control, or impoundment of the waters of any stream or body of water (greater than 4.1 hectares [10 acres]), including wetlands, to first consult with the USFWS. Any such project must make adequate provision for the conservation, maintenance, and management of wildlife resources. The act requires a Federal agency to give full consideration to the recommendations of the USFWS and to any recommendations of a state agency on the wildlife aspects of a project.

The Migratory Bird Treaty Act protects many species of migratory birds (16 U.S.C. 703-712). Specifically, the act prohibits the pursuit, hunting, taking, capture, possession, or

killing of such species or their nests and eggs. The act further requires that any affected Federal agency or department must consult with the USFWS to evaluate ways to avoid or minimize adverse effects on migratory birds.

The Marine Mammal Protection Act, as amended, was enacted to protect all marine mammals in state and Federal waters, with a goal toward maintaining optimal sustainable populations of all marine mammal species. Although the taking of marine mammals is prohibited, regulations permitting the Act provide a mechanism for allowing the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity within a specified geographical region. The National Marine Fisheries Service (NMFS) is responsible for the conservation and management of pinnipeds (excluding walruses) and cetaceans, while the USFWS is responsible for walruses, sea and marine otters, polar bears, manatees and dugongs.

Under the Marine Mammal Protection Act, a take is defined as "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." Incidental takes may be authorized by NMFS permit for U.S. citizens engaging in activities other than commercial fishing, for periods of up to 54 years, but only if it is determined by NMFS that the takes will have no mere than negligible effect on the species in question.

Cultural Resources

The Historic Sites Act of 1935 authorizes the Secretary of the Interior to designate areas as national natural landmarks for listing on the National Registry of Natural Landmarks (16 U.S.C. 461 et seq.). In conducting an environmental review of a proposed Federal agency action, the responsible official shall consider the existence and location of natural landmarks using information provided by the National Park Service pursuant to 35 Code of Federal Regulations (CFR) 62.6(d) to avoid undesirable impacts upon such landmarks.

Under Section 106 of the National Historic Preservation Act (16 U.S.C. 470 et seq.) and Executive Order 11593, if a Federal agency undertaking affects any property with historic, architectural, archaeological, or cultural value that is listed on or eligible for listing on the National Register of Historic Places, the responsible official shall comply with the procedures for consultation and comment promulgated by the Advisory Council on Historic Preservation in 36 CFR Part 800. The responsible official must identify properties affected by the undertaking that are potentially eligible for listing on the National Register and may request a determination of eligibility from the Keeper of the National Register, Department of the Interior, under the procedures in 36 CFR Part 63.

Under the National Historic Preservation Act, if a Federal agency activity may cause loss or destruction of significant scientific, prehistoric, historic, or archaeological property, the responsible official or the Secretary of the Interior is authorized to undertake data recovery and preservation activities. Data recovery and preservation activities shall be conducted in accordance with implementing procedures promulgated by the Secretary of the Interior.

General

NEPA (42 U.S.C. 4321 et seq.) is the basic U.S. charter for protection of the environment. It establishes policy, sets goals, and provides means for carrying out the policy. The NEPA contains "action-forcing" provisions to make sure that Federal agencies act according to the letter and the spirit of the act. NEPA procedures must ensure that environmental information is available to public officials and citizens before decisions are made and before actions are taken. Accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing the NEPA. The NEPA process is intended to help public officials make decisions that are based on an understanding of environmental consequences, and take actions that protect, restore, and enhance the environment.

The Council on Environmental Quality Regulations for Implementing the Procedural Provisions of the NEPA (40 CFR 1500-15080) are issued pursuant to NEPA; the Environmental Quality Improvement Act of 1970, as amended (42 U.S.C. 4371 et seq.); section 309 of the Clean Air Act, as amended (42 U.S.C. 7609); and Executive Order 11514, Protection and Enhancement of Environmental Quality (as amended by Executive Order 11991). The purpose of the regulations is to provide direction to Federal agencies so they understand how to comply with the procedures and achieve the goals of the NEPA process.

Hazardous Materials and Waste

Under the Resource Conservation and Recovery Act (RCRA), Congress declares the national policy of the United States to be, whenever feasible, the reduction or elimination, as expeditiously as possible, of hazardous waste (42 U.S.C. 6901 et seq.). Waste that is nevertheless generated should be treated, stored, or disposed of so as to minimize the present and future threat to human health and the environment.

The RCRA defines waste as hazardous through four characteristics: ignitability, corrosivity, reactivity, or toxicity. Once defined as a hazardous waste, the RCRA establishes a comprehensive cradle-to-grave program to regulate hazardous waste from generation through proper disposal or destruction.

The RCRA also establishes a specific permit program for the treatment, storage, and disposal of hazardous waste. Both interim status and final status permit programs exist.

Any underground tank containing hazardous waste is also subject to RCRA regulation. Under the act, an underground tank is one with 10 percent or more of its volume underground. Underground tank regulations include design, construction, installation, and release-detection standards.

The RCRA defines solid waste as any garbage, refuse, or sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations and from community activities.

To regulate solid waste, the RCRA provides for the development of state plans for waste disposal and resource recovery. The RCRA encourages and affords assistance for solid waste disposal methods that are environmentally sound, maximize the utilization of valuable resources, and encourage resource conservation. The RCRA also regulates mixed low-level radioactive wastes. A mixed waste contains both a hazardous waste and radioactive waste.

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)—commonly known as Superfund—provides for funding, cleanup, enforcement authority, and emergency response procedures for releases of hazardous substances into the environment (42 U.S.C. 9601 et seq.).

The CERCLA covers the cleanup of toxic releases at uncontrolled or abandoned hazardous waste sites. By comparison, the principal objective of the RCRA is to regulate active hazardous waste storage, treatment, and disposal sites to avoid new Superfund sites. The RCRA seeks to prevent hazardous releases; a release triggers the CERCLA.

The goal of the CERCLA-mandated program (Superfund) is to clean up sites where releases have occurred or may occur. A trust fund supported, in part, by a tax on petroleum and chemicals supports the Superfund. The Superfund allows the Government to take action now and seek reimbursement later.

The CERCLA also mandates spill-reporting requirements. The act requires immediate reporting of a release of a hazardous substance (other than a Federally permitted release) if the release is greater than or equal to the reportable quantity for that substance.

Title III of the Superfund Amendments and Reauthorization Act (SARA) (42 U.S.C. 9601 et seq.) is a freestanding legislative program known as the Emergency Planning and Community Right to Know Act of 1986. The act requires immediate notice for accidental releases of hazardous substances and extremely hazardous substances; provision of information to local emergency planning committees for the development of emergency plans; and availability of Material Safety Data Sheets, emergency and hazardous chemical inventory forms, and toxic release forms. (Emergency Planning and Community Right-to-Know Act of 1986, 42 U.S.C. 11001 et seq.)

The Emergency Planning and Community Right to Know Act (EPCRA) of 1986 requires each state to designate a state emergency response commission. In turn, the state must designate emergency planning districts and local emergency planning commissions (42 U.S.C. 11001 et seq.). The primary responsibility for emergency planning is at the local level.

The Pollution Prevention Act of 1990 established that pollution should be prevented at the source, recycled or treated in an environmentally safe manner, and disposed of or otherwise released only as last resort. Executive Order 12856, "Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements," commits Federal agency

planning, management, and acquisition to the Pollution Prevention Act of 1990. It also requires all Federal facilities to comply with the EPCRA, develop a written pollution prevention strategy emphasizing source reduction, and develop voluntary goals to reduce total releases and off-site transfers of Toxic Release Inventory toxic chemicals by 50 percent by 1999.

The Toxic Substances Control Act (TSCA) authorizes the administrator of the U.S. EPA broad authority to regulate chemical substances and mixtures which may present an unreasonable risk of injury to human health or the environment (15 U.S.C. 2601 et seq.).

Under the TSCA the U.S. EPA may regulate a chemical when the administrator finds that there is a reasonable basis to conclude that the manufacture, processing, distribution in commerce, use, or disposal of a chemical substance or mixture poses or will pose an unreasonable risk of injury to health or the environment.

Under the TSCA the U.S. EPA administrator, upon a finding of unreasonable risk, has a number of regulatory options or controls. The U.S. EPA's authority includes total or partial bans on production, content restrictions, operational constraints, product warning statements, instructions, disposal limits, public notice requirements, and monitoring and testing obligations.

The TSCA Chemical Substance Inventory is a database providing support for assessing human health and environmental risks posed by chemical substances. As such, the inventory is not a list of toxic chemicals. Toxicity is not a criterion used in determining the eligibility of a chemical substance for inclusion on the inventory.

The Transportation Safety Act of 1974, subtitled the Hazardous Materials Transportation Act (49 U.S.C. 1801-1819), centralized in the Department of Transportation the authority to promulgate and enforce hazardous materials regulations for all modes of transportation. These regulations may govern any safety aspect of transporting hazardous materials, including the packing, repacking, handling, labeling, marking, placarding, and routing (other than with respect to pipelines).

Other areas subject to regulation by the Department of Transportation are the manufacturing, fabricating, marking, maintenance, reconditioning, repairing, and testing of any package or container which is certified or sold for use in transporting hazardous materials. The registration of applicable personnel involved with these operations may also be required and regulated.

The law authorized the establishment of criteria for the handling of hazardous materials. This criteria may include the designation of a minimum number of personnel to be involved in hazardous materials shipments, the establishment of minimum qualifications and training levels for such personnel, requirements for inspections, specifications for equipment to be used for the detection of hazardous materials, and the establishment of a

system of monitoring safety assurance procedures for the transportation of hazardous materials.

Health and Safety

The U.S. Occupational Safety and Health Administration (OSHA) is responsible for protecting worker health and safety in non-military workplaces. The OSHA regulations can be found in Title 29 of the CFR. For all Army operations, AMC Regulation 385-100, *Safety Manual*, establishes the basis for worker safety programs.

The act further provides that each Federal agency has the responsibility to establish and maintain an effective and comprehensive occupational safety and health program that is consistent with national standards. Each agency must:

- Provide safe and healthful conditions and places of employment
- Acquire, maintain, and require use of safety equipment
- Keep records of occupational accidents and illnesses
- Report annually to the Secretary of Labor

Finally, the SARA (42 U.S.C. 9601 et seq.) requires OSHA to issue regulations specifically designed to protect workers engaged in hazardous waste operations. The hazardous waste rules include requirements for hazard communication, medical surveillance, health and safety programs, air monitoring, decontamination, and training.

Protection of public health and safety is the responsibility of the U.S. EPA (mandated through a variety of laws—the RCRA, CERCLA/SARA, and the Clean Air Act). U.S. EPA regulations can be found in 40 CFR. Additional safety responsibilities are placed on the Department of Transportation for transportation issues (49 CFR), the Department of Defense (Department of Defense Directives, applicable to military operations only), and the Department of the Army (program requirements established in AMC 385-100). There are no established standards for protection of buildings and equipment; however, general policy is to minimize all potential damages that may occur. Protection of flora and fauna is described under biological resources.

Executive Order 12898 directs Federal actions to address environmental justice in minority and low-income populations. Each Federal agency must conduct its programs, policies, and activities that substantially affect human health or the environment in a manner that ensures that they do not exclude persons from participation or benefit. Persons will also not be discriminated under such programs, policies, or activities because of their race, color, or national origin.

Noise

The Federal Noise Control Act directs all Federal agencies to the fullest extent within their authority to carry out programs within their control in a manner that furthers the promotion of an environment free from noise that jeopardizes the health or welfare of any

American (42 U.S.C. 4901 et seq.). The act requires a Federal department or agency engaged in any activity resulting in the emission of noise to comply with Federal, state, interstate, and local requirements respecting control and abatement of environmental noise.

Water Quality

The objective of the Clean Water Act is to restore and maintain the chemical, physical, and biological integrity of the nation's waters (33 U.S.C. 1251 et seq.).

The Clean Water Act prohibits any discharge of pollutants into any public waterway unless authorized by a permit (33 U.S.C. 1251 et seq.). Under the Clean Water Act the National Pollutant Discharge Elimination System (NPDES) permit establishes precisely defined requirements for water pollution control.

NPDES permit requirements typically include effluent limitations (numerical limits on the quantity of specific pollutants allowed in the discharge); compliance schedules (abatement program completion dates); self-monitoring and reporting requirements; and miscellaneous provisions governing modifications, emergencies, etc.

Under the Clean Water Act the U.S. EPA is the principal permitting and enforcement agency for NPDES permits. This authority may be delegated to the states.

The Clean Water Act requires all branches of the Federal government involved in an activity that may result in a point-source discharge or runoff of pollution to U.S. waters to comply with applicable Federal, interstate, state, and local requirements.

The Safe Drinking Water Act sets primary drinking water standards for owners or operators of public water systems and seeks to prevent underground injection that can contaminate drinking water sources (42 U.S.C. 300f et seq.).

Under the Safe Drinking Water Act, the U.S. EPA has adopted National Primary Drinking Water Regulations (40 CFR, Part 141) that define maximum contaminant levels in public water systems. In addition, under the Safe Drinking Water Act the U.S. EPA may adopt a regulation that requires the use of a treatment technique in lieu of a maximum contaminant level. The U.S. EPA may delegate primary enforcement responsibility for public water systems to a state.

Appendix D
Air Quality

APPENDIX D
AIR QUALITY

This appendix addresses the operational release of hydrogen fluoride during laser testing and the potential accidental release of nitrogen trifluoride or fluorine.

Operational Releases

The Space-based Laser (SBL) is being developed as a chemical laser. The end product of the laser reaction of primary concern for air quality is hydrogen fluoride. The test system includes a deluge scrubber that would remove at least 95 percent of the hydrogen fluoride from the exhaust stream. Scrubbers rated at a similar efficiency have been shown to have an actual efficiency of greater than 99 percent. As a result of the scrubbing, less than 9.5 kilograms (21 pounds) of hydrogen fluoride would be released to the atmosphere during a test. A release of this magnitude was evaluated using the TSCREEN/PUFF computer model. TSCREEN is a U.S. Environmental Protection Agency (U.S. EPA) approved modeling suite used to screen potential emissions. The screening process is based on conservative assumptions. If the screening indicates there is the potential for exceedances of the specified concentrations, then refined analysis should be conducted. If the screening process indicates no potential for exceedances then there is no reason to pursue refined modeling.

The PUFF model is used to model short-term gaseous releases, such as pressure valve releases. The proposed testing would result in emissions over a period of up to approximately 3 minutes with a total release of less than 9.5 kilograms (21 pounds) of hydrogen fluoride. Modeling this as a puff assumes the release occurs over a much shorter period of time. This would result in a higher concentration than the longer release time actually proposed and as such is a conservative assumption. The PUFF model indicates the maximum concentration beyond a specified "fence" boundary. For purposes of this analysis the boundary was set at 1,200 meters (0.75 miles), which coincides with the edge of the safety zone. Table D-1 indicates the results of the TSCREEN/PUFF modeling.

Table D-1: Summary of TSCREEN/PUFF Results for Hydrogen Fluoride Emissions

Chemical	Permissible Exposure Level[1]	Maximum Potential Concentration (mg/m^3) at a Distance of:					
		1.2 km[2]	3.0 km	5.0 km	7.0 km	10.0 km	30.0 km
Hydrogen Fluoride	2.5 mg/m^3	1.443[2]	0.663	0.332	0.197	0.313	0.341

Note: Concentrations were determined using assumptions outlined in text above and the TSCREEN/PUFF screening model.
[1] Source: NIOSH Pocket Handbook, 1999
[2] Maximum concentration to which operations personnel or the general public could be exposed occurs at the edge of the safety zone.

Modeling assumptions:

- Mass of emitted hydrogen fluoride = 9.5 kilograms (21 pounds)
- Atmospheric mixing height = 320 meters (1,050 feet)
- Wind speed = 1.0 meter/second (3.28 feet/second)
- Release height (stabilization height) above ground = 30 meters
- Atmospheric stability = Model calculates which atmospheric stability would result in the greatest concentration and uses it. In this instance the maximum concentrations occurred during stable atmospheric conditions.

The maximum concentration occurs at the fence line, which was set to coincide with the edge of the safety zone. It is assumed that higher concentrations would occur within the safety zone during testing. However, the safety zone would be evacuated before each test. As such, no personnel would be present and there would be no chance of exposure to emissions at higher concentrations than those that would occur at the safety zone boundary. The modeling indicates that under the assumptions presented above, there would be no exposure to hydrogen fluoride at levels above those established by the Occupational Safety and Health Administration (OSHA). No further analysis was conducted for operational releases.

Accidental Releases

Offsite consequences of potential leaks would be addressed by the facility's Risk Management Plan. Detailed planning of the Performance Test Chamber (PTC) and Integration and Test (I&T) Complexes has not been finalized, and details of the Risk Management Plan are not able to be determined at this time. When completed, the Risk Management Plan will include coordination with responsible civil and military agencies to ensure the rapid, effective response to reactant leaks.

The chemicals of concern for accidental releases would be nitrogen trifluoride and fluorine. The proposed action requires the storage of up to 3,184 kilograms (7,020 pounds) of nitrogen trifluoride and up to 9.5 kilograms (21 pounds) of fluorine.

The primary hazard of an accidental release involves the transfer of the reactants from the delivery truck to the storage tanks or transfer from the storage tank to the test apparatus.

All reactant transfer operations would follow an established procedure to minimize the potential for accidental releases. Since this is a planned event, it would be possible to conduct meteorological monitoring and dispersion modeling prior to transfer operations. If conditions indicate that there would be no potential for hazardous concentrations beyond the safety zone, the transfer operation would continue. If the modeling indicated a potential for a leak to result in hazardous concentrations beyond the 1.2-kilometer (0.75-mile) safety zone, then the operations would be delayed until conditions changed sufficiently to assure safe conditions beyond the boundary.

The second, less likely, scenario for a reactant leak is one involving some form of containment failure that would cause a leak at an undetermined time. The likelihood of this occurring is remote, but such a release would be considered by the Risk Management Plan.

Following the procedure outlined above for the operational releases, the potential releases of both nitrogen trifluoride and fluorine were screened using the TSCREEN/PUFF model. Both screenings indicated a potential for hazardous conditions beyond the safety zone. Additional analysis was conducted using the AFTOX model. Tables D-2 and D-3 summarize the results of the AFTOX modeling for fluorine and nitrogen trifluoride, respectively. The AFTOX model indicated that if a complete release of either reactant occurred during periods of low wind and high atmospheric stability, there would be a potential for exceedance of the health-based guidance levels beyond the safety zone. The modeling also indicated that in conditions of at least slightly unstable atmosphere the fluorine would not exceed the short-term exposure limit (STEL) or the immediately dangerous to life or health (IDLH) levels beyond the safety zone. The nitrogen trifluoride would potentially exceed the OSHA workplace Permissible Exposure Level (PEL), but would not exceed the IDLH levels beyond the safety zone.

The likelihood of a complete release is remote. However, the Risk Management Plan required by the Clean Air Act section 112(r) would address the immediate response to be taken in order to minimize the impact such an accident could have on the populace and on the environment.

Modeling assumptions and limitations for AFTOX:

- Ambient Temperature = 25°C (77°F)
- Ambient Pressure = 1 atmosphere
- Relative Humidity = 50%
- Station Location = Gulfport, MS. Used to determine insolation values.
- Surface Roughness = 0.03 meter (0.098 foot).
- Release Height and Duration = 0 meters and "instantaneous" release (less than 15 seconds).
- Concentration averaging time = 1 minute (would tend to overestimate longer time-weighted averaging distances (OSHA PEL), and slightly underestimate instantaneous concentration distances (IDLH)
- Atmospheric stability and wind speed were varied during testing in order to determine the conditions that resulted in the highest concentrations at various distances.

Table D-2: Summary of AFTOX Results for an Accidental Fluorine Release

	Scenario Parameters			
Atmospheric Stability	**Very Stable**	**Slightly Unstable**	**Slightly Unstable**	**Moderately Unstable**
Wind Speed	**1.5 meters/second (3.4 miles/hour)**	**1.5 meters/second (3.4 miles/hour)**	**2.5 meters/second (5.6 miles/hour)**	**2.5 meters/second (5.6 miles/hour)**
Guidance Level	Distance to which guidance level could be exceeded—kilometers (miles)			
ACGIH STEL 2 ppm	4.96 (3.08)	1.01 (0.63)	0.95 (0.59)	0.64 (0.40)
NIOSH IDLH 25ppm	1.35 (0.84)	0.38 (0.24)	0.21 (0.13)	0.11 (0.07)

Notes:

Guidance Levels Source: NIOSH Pocket Guide available online at http://www.cdc.gov/niosh/npg/npg.html. Accessed June 29, 1999.

(1) Atmospheric Stability is a measure of the disturbances in the lower atmosphere. In general, the higher the instability, the greater the rate of dilution. U.S. EPA guidance suggests a stable or very stable atmosphere be used in worst-case analyses.

(2) Wind is assumed to blow constantly in a single direction. U.S. EPA guidance suggests a wind speed of 1.5 meters/second be used in worst-case analyses.

(3) Exceedance distances are the maximum distance at which the model indicated the specified concentration would occur under the modeled meteorological conditions.

(4) The ACGIH STEL is the level to which workers could be repeatedly exposed for 15-minute periods, followed by a period of no exposure, with no longterm health impacts. It is calculated as a 15-minute time-weighted average.

(5) The NIOSH IDLH is the level above which those exposed could suffer lasting health impacts or could be impaired from escaping the immediate environment. It is intended to be measured as an instantaneous concentration.

(6) The AFTOX model is limited to time-weighted averages of 1-minute for instantaneous gaseous releases. As such, the distances to the STEL could be overestimated and the distances to the IDLH may be slightly underestimated.

Table D-3: Summary of AFTOX Results for an Accidental Nitrogen Trifluoride Release

	Scenario Parameters			
Atmospheric Stability	**Very Stable**	**Slightly Unstable**	**Slightly Unstable**	**Moderately Unstable**
Wind Speed	**1.5 meters/second (3.4 miles/hour)**	**1.5 meters/second (3.4 miles/hour)**	**2.5 meters/second (5.6 miles/hour)**	**2.5 meters/second (5.6 miles/hour)**
Guidance Level	Distance to which guidance level could be exceeded—kilometers (miles)			
NIOSH IDLH 1,000 ppm	2.71 (1.68)	0.65 (0.40)	0.63 (0.39)	0.46 (0.29)

Guidance Levels Source: NIOSH Pocket Guide available online at http://www.cdc.gov/niosh/npg/npg.html. Accessed June 29, 1999.

Notes:

(1) Atmospheric Stability is a measure of the disturbances in the lower atmosphere. In general, the higher the instability, the greater the rate of dilution. U.S. EPA guidance suggests a stable or very stable atmosphere be used in worst-case analyses.

(2) Wind is assumed to blow constantly in a single direction. U.S. EPA guidance suggests a wind speed of 1.5 meters/second be used in worst-case analyses.

(3) Exceedance distances are the maximum distance at which the model indicated the specified concentration would occur under the modeled meteorological conditions.

(4) The NIOSH IDLH is the level above which those exposed could suffer lasting health impacts or could be impaired from escaping the immediate environment. It is intended to be measured as an instantaneous concentration.

(5) There is no established ACGIH STEL for nitrogen trifluoride.

(6) The AFTOX model is limited to time-weighted averages of 1 minute for instantaneous gaseous releases. As such, the distances to the STEL could be overestimated, and the distances to the IDLH may be slightly underestimated.

Appendix E
Cultural Resources

APPENDIX E
CULTURAL RESOURCES

STENNIS SPACE CENTER
LIST OF BUILDINGS ASSOCIATED WITH THE
MAN IN SPACE THEME
AND REQUIRING HISTORIC EVALUATION IN THE YEAR 2013

	Building Number	Year Completed
1	1100	1965
2	1105	1965
3	1110	1965
4	1200	1965
5	1201	1964
6	2101	1964
7	2105	1967
8	2201	1964
9	2203	1965
10	2204	1964-1966
11	2205	1965
12	3101	1966
13	3102	1966
14	3201	1966
15	3202	1965
16	3203	1966
17	3204	1965
18	3305	1965
19	4110	1965
20	4120	1967
21	4400	1966
22	4995	1965
23	7001	1966
24	7002	1966
25	8201	1965

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